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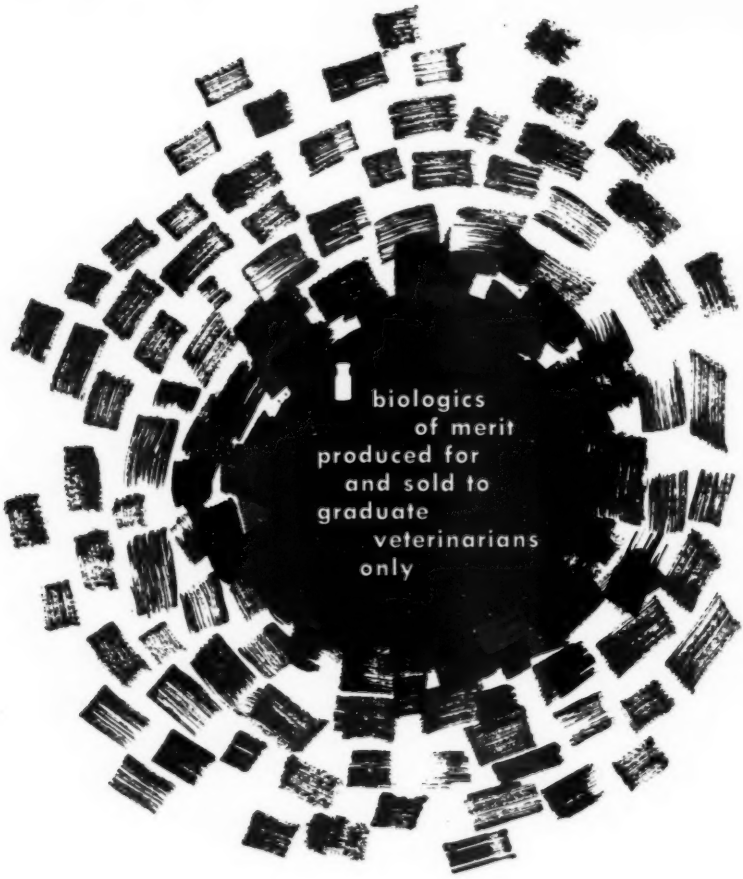

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Veterinary Medicine • *Volume 56* • *Number 5* • *May 1961*

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Differentiation Between Vaccinal And Infectious Brucellosis Titers In Cattle

D. E. Rodabaugh, D.V.M., M.S.
Cecil Elder, D.V.M., M.S.
Columbia, Missouri

This is a preliminary report on the use of an acidified brucellosis antigen to differentiate between vaccinal and infectious titers. Application of this technic indicates correlation with herd histories in a high percentage of 200 samples tested.

The development of *Brucella abortus* Strain 19 vaccine as an aid in control of brucellosis has greatly augmented the success of state and federal programs for bovine brucellosis eradication. There is, however, one serious drawback to the use of the vaccine when using the agglutination test as a means of determining the infection status of cattle. Injection of Strain 19 organisms into a susceptible animal causes a rapid response of the defense mechanisms of the body, resulting in a rise of the agglutination titer of the blood. Since the presence of agglutinins is the basis for determining an infected animal, the stimulation of agglutinins by injection of Strain 19 results in considerable confusion in interpretation of the infection status of an animal.

Following vaccination of adult cattle, the agglutination titer is very strongly stimulated and continues to be present for long periods of time. Fortunately, in vaccinated heifer calves this titer does not persist for more than a few weeks to a few months, and usually by the time the heifers have reached sexual maturity, the reaction has disappeared completely. There are instances, however, when this titer does persist in vaccinated heifers and such probability increases as the age at which the heifers were vaccinated is increased.

Numerous attempts have been made to develop a means of differentiating between the reaction caused by the injection of Strain 19 vaccine and the reaction caused by virulent field infection. One of the earlier reports[1] described a method of differentiating between these titers by means of injecting Strain 19 vaccine into the animals and observing the titer response. Previously, vaccinated animals would respond by an immediate increase in agglutination titer whereas infected cattle reportedly did not develop an increase in titer. This technic was found to be inaccurate with some individual animals.[2] A variation of this

The authors are associated with the Department of Veterinary Pathology, School of Veterinary Medicine, University of Missouri, Columbia, Missouri. Journal Series No. 2265, approved by the Director. Contribution from the Missouri Agricultural Experiment Station.

method was subsequently reported by another group of workers[3] wherein killed Strain 19 organisms were used instead of live vaccine. There were also instances when this technic gave variable results.[4]

Additional workers have suggested various other methods of differentiation, such as the use of a modified ring test on milk[5] and applying the whey agglutination technic.[6] These methods have not been widely accepted, possibly because of difficulties in interpretations and problems in obtaining material to be tested.

Experimental work at this station has included the use of these technics as well as others[7,8] in an attempt to develop a simple and rapid method of differentiating between infected and vaccinated cattle. The method reported in this paper involves the use of a modification of an acidified antigen technic previously reported as a means of eliminating non-specific reactions in the plate agglutination test.[9]

Material and Methods

Our work originally involved the culturing of a virulent strain of *Brucella abortus* for preparation of a suitable antigen, but it was later found that standard plate antigen prepared and distributed by the Agricultural Research Service of the USDA could be modified and used with equal success. Two quantities of official standard plate antigen were diluted by the addition of equal parts by volume of 0.5% phenolized physiological saline. One of the above quantities was then acidified to a pH of 3.0 by the addition of 0.04 ml. of glacial acetic acid per each milliliter of the diluted antigen. The acid was added slowly during constant agitation. The second quantity of diluted antigen was not acidified and was used as a control for the acidified antigen.

The mixtures thus prepared were used as rapid plate antigens, utilizing standard

TABLE 1

A Comparison of Plate Agglutination Titers of Vaccinated Cattle when Using Non-acidified and Acidified Antigens with One Minute Readings

Animal number	Non-acidified Antigen					Acidified Antigen				
	1:25	1:50	1:100	1:200	1:400	1:25	1:50	1:100	1:200	1:400
205	+	+	I	—	—	+	+	I	—	—
207	+	+	—	—	—	+	+	—	—	—
209	+	I	—	—	—	+	tr	—	—	—
213	+	I	—	—	—	+	tr	—	—	—
215	+	—	—	—	—	—	—	—	—	—
218	+	I	—	—	—	+	—	—	—	—
220	+	+	+	+	+	+	+	+	+	I
222	+	+	+	+	tr	+	+	+	I	—
225	+	+	+	+	+	+	+	+	+	I
226	+	+	+	I	tr	+	+	+	I	—
227	+	+	+	+	I	+	+	+	I	—
229	+	+	+	+	I	+	+	+	I	—
230	+	+	+	+	I	+	+	+	I	—
231	+	+	+	+	tr	+	+	+	I	—
232	+	+	+	+	—	+	+	+	+	—
233	+	+	+	+	tr	+	+	+	+	tr

Animal numbers 220 through 233 were vaccinated with Strain 19 vaccine 30 days prior to test.
(I) indicates incomplete agglutination
(tr) indicates a trace of agglutination

TABLE 2

A Comparison of Plate Agglutination Titers of Infected Cattle when Using Non-acidified and Acidified Antigens with One Minute Readings

Animal number	Non-acidified Antigen					Acidified Antigen				
	1:25	1:50	1:100	1:200	1:400	1:25	1:50	1:100	1:200	1:400
293	+	—	—	—	—	+	+	+	I	—
609	+	+	—	—	—	+	+	+	+	I
856	+	+	I	—	—	+	+	+	tr	—
860	+	+	tr	—	—	+	+	+	I	—
866	+	—	—	—	—	+	+	+	I	—
868	+	+	+	—	—	+	+	+	+	I
874	+	—	—	—	—	+	+	+	tr	—
879	+	—	—	—	—	+	+	I	—	—
880	+	I	—	—	—	+	+	I	—	—
887	+	+	tr	—	—	+	+	+	+	tr
895	+	I	—	—	—	+	+	+	I	—

(I) indicates incomplete agglutination
(tr) indicates a trace of agglutination

equipment and technics for conducting routine plate agglutination tests. Duplicate series of sera were pipetted onto the testing plate in amounts of 0.04 ml., 0.02 ml., 0.01 ml., 0.005 ml. and 0.0025 ml., respectively. The acidified antigen was added to one series by a standard dropper delivering 0.03 ml. of antigen per drop, and the non-acidified antigen was added to the second series by a similarly calibrated dropper. The mixtures on the plate were immediately stirred with clean applicator sticks, gently rotated for 1 minute and results recorded within 1 minute after mixing. The serum of an animal causing agglutination of the acidified antigen to the extent of at least 1 dilution greater than that of the non-acidified antigen was regarded as containing agglutinins for a virulent strain of *Brucella abortus*. The serum of an animal showing no increase in titer with acidified antigen was regarded as containing agglutinins stimulated by Strain 19 vaccine or non-specific infections causing cross agglutination with brucellar antigens. Sera showing titers of 1:400 or higher were diluted with negative serum in order to bring the end-point reaction within range of the plate technic.

Results

Serum samples taken from cattle with known histories of vaccination without field infection being present invariably showed no increase in agglutination titers with acidified antigen when compared to their reactions with non-acidified antigen (Table 1), whereas sera from cattle with a known history of field infection without vaccination showed an increase in agglutination titer of at least 1 dilution with acidified antigen, as compared to the reaction with the non-acidified antigen (Table 2).

Over 200 additional serum samples were obtained from the Missouri Brucellosis Testing Laboratory in Jefferson City and tested with this differential technic. The results were found to correlate with the herd histories in a high percentage of the cases (Table 3). It was recognized from the beginning that we would not get complete correlation between the differential test and the herd histories in all of these miscellaneous samples. We could expect an occasional vaccinated animal to be infected even though there was a history of calfhood vaccination in the herd. Likewise, we might expect to find some animals that had been

vaccinated without such information being reported on the test charts. A rather high percentage (38%) of 1+ reactions in sera originating from non-vaccinated cattle was shown to be of a non-infected nature by the differential test (Table 3). Many of these samples were from animals in previously infected herds which were being retested for certification and were the only reactions found. Others were from occasional suspects encountered in area testing of otherwise negative herds.

There were a few occasions where the history of the herd or individual animals strongly indicated infection, yet the differential technic did not indicate infection. In one such herd, where it was evident from the herd history that infection was spreading quite rapidly, we were able to secure another set of blood samples from the same reactor animals approximately 90 days later. A retest of 9 animals, which on first test indicated a vaccinal type of reaction, now showed an infection reaction in 8 samples, with only one still showing a vaccinal type reaction.

Discussion

The acidified antigen prepared as described appears to be a means of differentiating infection and vaccinal titers in most cases. Apparently in recently infected herds where titers are ascending, the test fails to indicate the status of individual animals. We believe, in instances wherein a questionable animal is carrying a stabilized titer for a period of 1 or more months, the acidified antigen technic would be a satisfactory means for differentiation.

In those herds where it appears there may be a fulminating infection in progress, it would be desirable to hold questionable animals in isolation and retest at the end of 30 days or more. Those animals with ascending titers would undoubtedly be infected, and those with stabilized titers would be suitable for application of the differential test described in this paper.

The addition of acetic acid to standard plate antigen is believed to remove the cell surface antigens which show no specificity between infection and vaccine stimulated agglutinins, thereby exposing the inner cell body antigens which show greater specificity. Theoretically, an animal infected with virulent organisms and experiencing a more severe invasion of the tissues would be stimulated to produce agglutinins for all antigenic components of the invading cells, whereas an animal subjected to organisms of much less virulence, as in Strain 19, might be stimulated principally by surface antigens.

The differential test outlined will need to be applied to many hundreds of samples under varying conditions before its true value can be established. It is the hope of the authors that this preliminary report will stimulate those connected with brucellosis testing laboratories to use this technic in conjunction with routine testing to further evaluate its efficacy.

TABLE 3

Results Obtained when Applying the Differential Acidified Antigen Technic to Reacting Sera of Animals Originating in Vaccinated and Non-vaccinated Herds

Missouri Testing Laboratory Results			Differential Reaction in 100 Vaccinated Cattle		Differential Reaction in 100 Non-vaccinated Cattle	
1:50	1:100	1:200	Non-infected	Infected	Non-infected	Infected
+	—	—	69	3	38*	10
+	+	—	15	3	3	5
+	+	+	4	6	1	43

*Many of these samples were from previously infected herds which were being retested for certification and were the only reactions found.

Summary

A means of differentiating between infectious and vaccinal titers in brucellosis of cattle has been described. The method employed appeared to be specific in a limited number of vaccinated cattle and cattle of known infection status. Application of the technic to more than 200 samples obtained from a brucellosis testing laboratory indicated correlation with herd histories in a high percentage of the samples tested. There was an apparent failure of the differential test when applied to sera of cattle with ascending titers. Further evaluation should be made with many hundreds of blood samples under varying conditions before definite conclusions are drawn.

ACKNOWLEDGEMENT

The authors wish to acknowledge the valuable help of Miss Jacqueline Raithel of the Missouri Brucellosis Testing Laboratory in furnishing serum samples and herd data used in this investigation.

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Listeriosis in Man

Incidence of the various forms of infection by *Listeria monocytogenes*, a Gram-positive bacillus with a wide host range including man and animals, is undoubtedly more common than sporadic reported cases indicate.

Dr. Nelson R. Blackburn, Associate Pathologist, Eastern Maine General Hospital, Bangor, and H. L. Chute, D.V.M., Professor of Animal Pathology, University of Maine Orono, urge a greater awareness of this disease, especially in the newborn, in order to recognize more cases.

The combination of penicillin and Erythromycin® offers optimal therapy of Listeria infections, according to a recent review by Hoeprich. Sensitivity studies show that sulfonamides, the tetracyclines, chloramphenicol and Carbomycin® are all inhibitory. The mortality rate has been reported as approximately 30%.

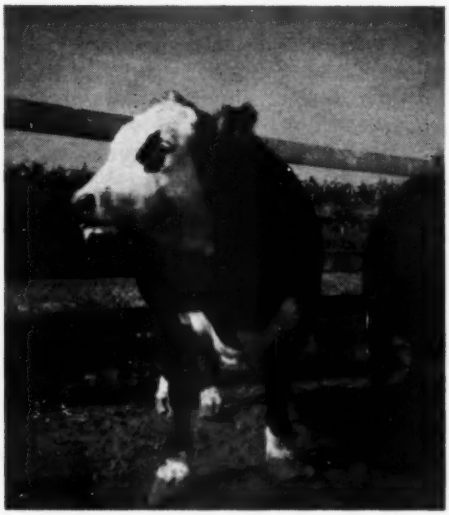
In man, infections of the central nervous system and generalized sepsis with miliary granulomatosis of the newborn accounted for approximately 60% of the 298 reported cases collected from the world literature by Seeliger in 1955. Other less common clinical manifestations include generalized adenopathy, conjunctivitis, subacute bacterial endocarditis and a typhoid-like syndrome.

The epidemiology of infection by Listeria remains obscure. The exact mode of sporadic human listeriosis is not known. One investigator has suggested that subclinical and chronic forms of this disease may exist in both animals and man.

A most significant point for the bacteriologist to be aware of, in the authors' opinion, is that whenever an unidentified Gram-positive bacillus is seen on smears (especially from the spinal fluid) or grown on culture, the possibility of Listeria should be considered. Agglutination tests have been described and the anti-sera is commercially available.

Jour. Maine Med. Assn., 51:420-421 (December) 1960

The necrotic tongue tip bothered these steers, but not enough to cause any noticeable loss of condition. Through hampered, they continued to eat and drink.



Have you seen Necrotic Glossitis? Dr. W. L. Wake, Animal Disease Eradication Division, ARS, reported on 7 instances in the January 1, 1961 issue of the Journal of The AVMA. Independent reports from Michigan and Illinois tend to follow closely the clinical pattern of this case report: No mortality, 100% morbidity with a 45 to 90 day course. Cattle remain in surprisingly good condition for the degree of tongue involvement present. Your clinical observations would be appreciated.

Necrotic Glossitis in Feedlot Steers

J. K. Hill, D.V.M.
Titonka, Iowa
John B. Herrick, D.V.M.
Extension Veterinarian
Iowa State University

On July 29, 1960, a call came to examine a steer at a large feeding operation. It was salivating and drooling profusely. This steer weighed about 1,000 lb. and had been on full feed for several months. He was confined and his temperature checked. It was normal. Then the mouth, teeth, gums, tongue and all buccal surfaces were checked. The only lesion found was on the tip of the tongue. This tip was very sore and irritated. Although the animal did not appear to have lost any weight, the tongue was so sore that it was bothering him.

This feeding operation had about 500 head of cattle on feed. They were of 5 different breeds and bought directly from the Dakotas. The feeding operation was divided into 4 lots. Steers and heifers were fed separately. They were being fed shelled corn and concentrate in self feeders. Hay bunks and waterers were in each lot.

A steer that appeared to be just starting to salivate was put in a chute. About 1½ inches of the tip of his tongue was a blue-black color. There was a distinct line of demarcation separating this from the normal tissue. While an attempt was made to withdraw the tongue for examination, this discolored tip broke. The tissue was necrotic with only a small portion of the ventral tissue living to prevent the tip from breaking completely off.

At this time there was a lot of foot rot in the lots. It was decided that these tongue lesions were probably caused by the same infection. The affected steers would hold their mouths partially open with the tongue protruding. Since some of the hogs following these cattle were tail biters, it seemed logical that they were biting the sore tongues of these affected steers. The self feeders, hay bunks, waterers, fences and aluminum gates were thoroughly checked. None of these appeared to be the source of infection.

More new cases appeared daily. Specimens of the tongue lesions were taken for bacteriological examination.

A streptococcus and *Escherichia coli* were isolated. The strep. was sensitive to nearly all commonly used antibiotics and Gram-negative organisms.

The first clinical sign of this condition was excessive salivation and drooling. Then in a few days the steers would stand with their tongue protruding. They would get feed in their mouth, then tip the head back and chew. They spent a lot of time at the waterers lapping like a dog. It was difficult to detect any weight loss in the affected steers, but they probably did not gain as well.

The hogs were removed from the 2 west lots of steers, but more cases continued to appear. The final morbidity was at least 75% and probably was nearly 100%. It was suspected that there were many with a milder, subclinical infection. Only steers were affected. One heifer may have been affected sometime earlier before the general outbreak, but this was not certain. No treatment was used on these animals and none died from the condition.

Conjunctivitis Caused by IBR Virus

A. H. Quin, D.V.M.
Veterinary Consultant
Kansas City, Missouri

This report deals with an outbreak of conjunctivitis in a consignment of feeder calves. Although there were no other symptoms, IBR virus was isolated from eye swabs of affected calves. The report points out the possibility of widespread occurrence of the IBR virus as has been speculated by others.

In early February, 1961 a consignment of 60 head of 400 lb. Hereford steer calves arrived at the feeder pens of the Kansas City Public Stockyards. They unloaded in good shape and were put on prairie hay in bunks. They at no time showed any symptoms of shipping fever, I.B.R. (infectious bovine rhinotracheitis) or other systemic trouble.

Beginning 10 days after arrival an "eye trouble" appeared and within 2 weeks involved 42 of the 60 head. The owners, without benefit of veterinary guidance, administered combined penicillin-streptomycin at 4 day intervals, together with topical Aureomycin ophthalmic powder twice daily.

An examination of 5 head revealed normal temperature, respiration and pulse rate. The hair on the sides of their faces was matted from serous ocular discharges. Even

from a distance of several feet, swelling of the eyelids was apparent. There was no nasal discharge, no scouring and mouth membranes were normal.

Under restraint in good sunlight, the global conjunctiva appeared normal or slightly pink with moderately injected blood vessels. There was no ulceration of the corneas. The inner surface of each eyelid was "beefsteak red," considerably granulated with variable adhering clots of purulent exudate. The eye discharges were copious and serous in character.

Detailed inquiry divulged that the calves had received only blackleg vaccination on the home range. The eyes were not "snow burned." No phenothiazine had been given, and the calves had never been power-sprayed (possible eye trauma). Common pinkeye, infectious keratoconjunctivitis, was eliminated, as there was no clouding or ulceration of the cornea. From appearance of first symptoms and under topical treatment the disease ran its course in about 2 weeks. Only 3 head were left with "smoky" corneas.

Twenty eye swabs and blood samples were sent to Dr. T. L. Chow, veterinary virologist, College of Veterinary Medicine, Colorado State University of Colorado. Unfortunately, the shipment was delayed in transit and the blood samples were hemolyzed on arrival.

I.B.R. (infectious bovine rhinotracheitis) virus was isolated in tissue culture from the eye swabs. Routine bacteriological culturing of eye swabs by another laboratory yielded only *Moraxella bovis* and an untyped streptococcus.

Abinanti and Plumer[1] reported occurrence of palpebro-conjunctivitis involving 125 head of Maryland steers purchased at auction markets. The eye trouble began 6 weeks after purchase and eventually involved 2/3 of the cattle. As in the outbreak reported here, no respiratory or other systemic symptoms were noted. In the Maryland outbreak I.B.R. virus was isolated in tissue culture, serological finding were positive and an eye challenge of serologically-negative calves with the I.B.R. isolate reproduced the conjunctival pathology.

McKercher, Saito, Wada and Straub[2] of the California University Veterinary School, Davis, in discussing I.B.R., state that conjunctivitis is seen with and without accompanying respiratory signs.

Kendrick[3] *et al.* of the New York University Virus Research Laboratory have demonstrated the identity of I.B.R. and bovine pustular vulvovaginitis viruses. There is some as yet unpublished data that I.B.R. may be etiologically related to a pneumo-enteric syndrome of suckling calves. Accumulating serological evidence indicates rather widespread incidence of positive antibody titers in herds having no history of clinical cases.

One of the most important unanswered questions is whether or not I.B.R. virus has any etiological relationship to true pinkeye, one of the most common and costly cattle diseases.

Another question of immediate importance is whether state and federal regulations should institute restrictions or quarantine of feeder cattle affected with palpebro-conjunctivitis of I.B.R. origin.

A shipment of 60 head of 400 lb. feeder calves held in the pens of a public stockyard developed a severe palpebro-conjunctivitis 2 weeks after arrival, with 42 of the total 60 head affected. No other symptoms were detected. I.B.R. (infectious bovine rhinotracheitis) virus was isolated in tissue culture from the diseased eyes. Under topical treatment the disease ran its course in 14 days.

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General Practice Topics

Feedlot Therapeutics

Medication in the drinking water of cattle is used when the animals arrive so weak and tired that they cannot stand being run through a chute. Broad spectrum antibiotics and electrolytes or a combination of sulfathiazole and electrolytes have proven to be of value.

Another procedure that is being used more frequently is an injection of vitamin A when the cattle first arrive at the feedlot. There are 2 forms available, vitamin A palmitate in an oil base and a new combination of the vitamins A and D_2 in a lecithin base, which is injected intraruminally. The latter is absorbed quicker and gives a higher level and longer storage of vitamin A in the liver.

Infectious bovine rhinotracheitis vaccine has done an excellent job of controlling this disease and has resulted in a general reduction of respiratory disease. Feedlot operators in many of the western states believe it has greatly reduced shipping fever, pneumonias and other respiratory conditions. In areas where leptospirosis has become a feedlot problem, a combination IBR-Leptospirosis vaccine is used.

Respiratory complexes are the most important disease conditions of feedlot cattle. Where bacterial resistance is a problem, Neomycin has proven helpful. Along with antibiotics we use other therapy to relieve undue pain and stress. Some of the drugs used are: camphorated oil, antihistamines and for visibly depressed animals, a stimulant such as caffeine. One-half to 1 grain of atropine is helpful to reduce the copious discharges of the mucous membranes. Tranquilizers have been tried along with other therapy in treating respiratory complexes but do not appear to be worth the additional expense.

Recommendations for prevention of urinary calculi have been to feed high levels of salt. The levels recommended vary from 1% to 10% but the most common levels are about 3% to 5%. The theory is to stimulate the animals to drink more water, thereby increasing the amount of fluids eliminated which will help to wash out any calculi that may be forming.

When symptoms appear, Jenotone (Jensen-Salsbery Laboratories) has shown some benefit in relaxing the musculature of the urethra to enable the calculi to pass. It should be given intravenously for 2 to 3 days consecutively to get satisfactory results.

Foot rot is a common feedlot problem.

Organic iodides are used at 2 gm. to 4 gm. per head daily to aid in control. When a large outbreak occurs, the level is increased to 30 gm. per day for 5 to 7 days then returned to the lower prophylactic level.

Implantation of diethylstilbestrol often produces some undesirable side effects, such as raised tail heads, undue restlessness, patchiness of fat and udder development. These undesirable side effects are reduced some by the use of a combination of estrogen and progesterone. These work well in steers but cannot be used in heifers, as the combination mimics the pregnant animal. Implants of 20 mg. of estradiol benzoate and 200 mg. of testosterone propionate are available for use in steers and gives good results. A new preparation of 24 mg. of estradiol valorate, 60 mg. of testosterone enanthate and 60 mg. of progesterone caproate will soon be available for injection into both heifers and steers.

Many of the organic phosphate systemic insecticides have been found to be effective against gastro-intestinal parasites as well as cattle grubs, screw worms, horn flies, lice and ticks. Trolene as a bolus or Troamix (the feed grade from of the same drug) have been effective in controlling cattle grubs as well as giving good control of *Haemonchus, Cooperia* and *Ostertagiae* species. Single oral doses of Ruelene as a drench have demonstrated 90% to 100% reductions in the number of eggs per gram of feces as well as being effective against cattle grubs. This compound may be applied directly on a small area of the animal's back, too. An emulsifiable form of Ruelene that is diluted with 1 to 2 parts of water is applied at the rate of 1 ounce per 100 lb. of body weight, as they are put through a chute for other procedures. Another preparation is Co-Ral, which is a 25% wettable powder that can be sprayed on the cattle to control cattle grubs and other external parasites as well as showing a certain degree of effectiveness against gastro-intestinal parasites.

R. M. Cerniga, D.V.M.
Veterinary Consultant
Porterville, Calif.

When a black and white Shetland pony named Pete accidentally lost his left hind foot, Dr. F. W. Oehme (left) of Kansas State University's veterinary hospital set out to provide a new one. With the aid of a Manhattan shoe repairman and a K-State carpenter, a wooden leg was fashioned with an attached boot and straps.

The leg consists of a wooden stump, shaped to conform as nearly as possible to Pete's own body. The stump was hollowed out to allow Pete's leg to be set in it, and a leather boot was designed to fit on top of the wooden stump. A rubber heel, attached to prevent slipping, completed the assembly.

Reading Feed Tags

This is an exercise to determine how good you are at interpreting feed tag information. It is intended to point out some of the limitations of such information. The idea was taken from a presentation by J. A. Hoefer of Michigan State University.

Determine which is the better ration from the information in the table.

	Swine Ration	
	I	II
Protein %	15.1	15.0
Fat %	3.3	3.0
Fiber %	5.8	7.0
Calcium %	0.70	0.68
Phosphorus %	0.51	0.54

Perhaps most would choose ration No. 1 as the better as it apparently has more nutrients and less fiber. We would be aided in the decision if we were to open the feedbag and look at the feed, smell it, then give a little to some pigs to find if it is palatable.

If we were to do this, in addition to reading the tag, we would decide that ration No. 2 is far better. Ration No. 1 would sell inexpensively because it isn't worth much as feed or anything else. The ingredients of ration No. 1 are: a finely ground old shoe; some pieces of coal; a little crank case oil; a few corn cobs; some stones and a little paper.

This clearly shows that there are some limitations to what a feed tag can tell. Analytical values are worthwhile but with reservations. We must depend on other things including the integrity of the manufacturer. The majority of feed manufacturers are in business to stay and produce a quality product.

This can also serve to re-emphasize the fact that nutrients determined by chemical analysis are not necessarily well utilized by the animal. Practitioners may remember being told that they were foolish to use vitamin E therapeutically because there is an ample supply in normal rations. Now we know that it may be largely unavailable to the animal. As an example, only 1/3 of the vitamin E in alfalfa meal is biologically available. We also know that carotene is a variable source of vitamin A.

E. E. Slatter, D.V.M.

Stimulating Effect Of Ethyl Alcohol

The appetite-stimulating effect of ethanol has been shown in some experiments but could not be confirmed in others.

This experiment was designed to test the effect of ethyl alcohol in liquid supplement fed free choice. Thirty registered Hereford heifers averaging 392 lb. were divided into 2 pens. One group received 10% urea, 3% of 75% phosphoric acid, 67% molasses, 5.4% ethanol, 2% salt, and 10,000 units of vitamin A per pound of supplement. The only difference in the other group's ration was no ethanol, and 73% of the total was molasses. In addition, both groups were fed trace minerals, water and cotton seed hulls ad libitum.

The group with ethanol additive consumed 10% more cottonseed hulls and 18% more supplement. The animals' average total individual gain during the first 92 days was 59.2 lb., while the animals not receiving ethanol averaged 30 lb.

The ethanol-supplemented heifers had a healthy, alert appearance with better hair coats and appeared more vigorous at all times. Heifers in the other lot progressively developed arched backs, dull hair coats and general poor appearance. At the end of 92 days the ration had to be changed because the condition of this lot became so poor. Addition of milo and alfalfa meal to the rations improved the rate of gain of both groups, but the ethanol-supplemented group continued to gain faster.

W. A. Nipper and George L. Robertson
Louisiana State University and Agricultural Experiment Station

Tylosin Treatment of Bovine Pink Eye

L. F. Ellis, M.S.
L. E. Barnes, D.V.M.
Eli Lilly and Company
Agricultural Research Center
Greenfield, Indiana

During midsummer 1960, typical clinical signs of pink eye were observed in a herd of 65 young Holstein steers which had recently been brought into the station. Two weeks after the 1st case was recognized, every calf was showing signs of the disease. Since therapy with a mercurial compound did not improve the condition, treatment was attempted with Tylosin (Eli Lilly and Co.), a new antibiotic.

Tylosin, a macrolide type antibiotic, has been shown to have essentially a Gram-positive antibacterial spectrum with unusual activity against members of the genus *Hemophilus.*[1] Tylosin also possesses inhibitory action on spirochetes, certain large viruses and several members of the genus *Mycoplasma.*[2,3,4,5] The antibiotic is essentially nontoxic, nonirritating to the eye and conjunctival sac, stable and readily soluble in water.[6]

Individual examinations revealed that all the calves had conjunctivitis, usually of both eyes, and 35 had corneal opacities with ulceration. No evidence of blindness or corneal perforation was observed. In nearly all instances, lacrimation was increased to the extent that the face was wet from tears. No purulent exudate was seen. The calves were annoyed by swarms of face flies which hovered about their heads.

Fluid from the conjunctival sacs of 10 calves was collected with sterile swabs and inoculated onto proteose peptone No. 3 agar (Difco) containing 5% whole bovine blood. Following incubation at 37 C. for 24 hours, typical colonies of *Moraxella bovis* were found in cultures from 7 of the 10 calves. An *in vitro* test showed 1 isolate to be inhibited by tylosin at a level of 0.4 micrograms per ml.

An aqueous tylosin tartrate solution was prepared at a concentration of 50 mg. per ml. Twice daily for 3 consecutive days an estimated dose of 30 mg. of tylosin was sprayed with a Windex sprayer into both eyes of each calf. The calves were sprayed several times with a commercially available insecticide to reduce the number of face flies. All calves were observed individually on the 1st, 2nd, 3rd, 5th, and 12th days after the initial treatment. Casual observations were made for the remainder of the month.

All clinical signs except corneal opacity and ulceration disappeared within 5 days and no recurrences were seen. On the 5th day after treatment, attempts to isolate *M. bovis* from the eyes of the 10 calves previously cultured were negative.

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Sources of Nitrate Intoxication

C. B. Bjornson, B.S., D.V.M.; Patric McIlwain, B.S.;
D. F. Eveleth, D.V.M., Ph.D.; and F. M. Bolin, D.V.M.
North Dakota State University
and Agricultural Experiment Station
Fargo, North Dakota

When nitrogen is readily available but the plant is unable to utilize it because of adverse conditions, crude nitrogenous materials accumulate as a nitrate compound. Acute nitrate intoxications of livestock have been reported from corn silage, well water and weeds, such as pigweed, cereal grasses and grains. In addition there are chronic toxicities occurring from lower levels of the nitrate ion. One manifestation of this is believed to be vitamin A deficiencies that frequently are observed.

Poisoning due to nitrates causes sudden death losses when animals ingest feed or water containing toxic levels of the anion either alone or in combination. Nitrates *per se* are relatively nontoxic; their importance as a cause of poisoning is due to their conversion in the foodstuff or within the alimentary tract to nitrite. Nitrites compete with oxygen, converting the hemoglobin of the blood to methemoglobin, which is unable to function as an oxygen carrier. Lewis[1] found nitrites to be an intermediary product in the reduction of nitrate to ammonia within the rumen of the sheep and cow. It appears that above a certain concentration of nitrate the rate of reduction of nitrite to ammonia becomes limiting and subsequently nitrite accumulates.

Garner[2] reported the symtoms of nitrate intoxication are as follows: Signs of abdominal pain and diarrhea owing to the irritant action of the nitrate ion, tissue anoxia, *viz.* muscular weakness and incoordination, convulsions, accelerated heart rate, dyspnea, and progressive cyanosis leading to torpor, coma and death. In less severe intoxications listlessness may be the only symptom. Abnormal births and loss of milk production have been attributed to the ingestion of rations containing high levels of nitrate ion. Death from nitrate poisoning in pigs may occur without the manifestation of external signs. The postmortem picture is usually dominated by the dark, chocolate-colored, tarry blood, which on spectrophotometric evaluation may yield

Nitrate intoxication causes tissue anoxia. Signs of this are muscular weakness and incoordination, convulsions, accelerated heart rate, dyspnea and progressive cyanosis leading to coma and death.

up to 90% methemoglobin. From July 1959 to July 1960, the Veterinary Science Department at North Dakota State University diagnosed 47 cases of nitrate poisoning.

Case[3] reported that any amount of nitrate over 0.5% in the total ration is a potential source of trouble. The Missouri Agricultural Experiment Station found that a nitrate content as low as 5 p.p.m. will deplete vitamins A, D and E.

Garner[2] reported that nitrate poisoning had been described from the following sources: Artificial manures and agricultural chemicals containing salts of nitrate or nitrite, well water containing excess nitrate or feed prepared from this water, cereal grasses and numerous weeds which will concentrate nitrates under drought conditions, dynamite and certain nitrate-containing machine oils. The nitrate content of ponds, streams and shallow wells may reach the toxic level because of natural nitrification processes or contamination by drainage from feedlots or cultivated fields. Cereal grasses and many weeds readily concentrate nitrate under drought conditions. When readily available nitrogen is present in soil during dry conditions, these plants are unable to utilize this crude nitrogenous material as food, and it is concentrated in the plant as a nitrate compound. This department has found toxic levels of the nitrate ion in oats, oat hay, barley, rape, corn silage, corn cob meal, Russian thistle and pigweed.

The nitrate content of both solids and liquid was determined by the method of Wadsworth.[4] The basic reaction between the nitrate ion and 1, 2, 4-phenol-disulfonic acid yields 6-nitro-1, 2, 4-phenol-disulfonic acid. This compound, upon conversion by KOH to the alkaline salt, produces a yellow color which is utilized for colorimetric estimation.

Case Histories

Case 1: In March 1960, a veterinarian was called to a ranch where oat hay from a new stack had been fed to 80 head of cattle. Within 12 hours 43 were dead and 2 down. These animals were fed only hay and range cubes. The veterinarian reported that the rumen was greatly distended with gas and the blood a dark chocolate color. Quantitative analysis of the rumen content and 2 blood samples which were sent to the diagnostic laboratory proved to be at toxic nitrate levels. An analysis of the oat hay, which was cut and used because of drought conditions, revealed a nitrate level of 6.0% on a dry weight basis.

Case 2: In August 1960, a veterinarian reported that a farmer had 2 sick steers which showed symptoms of nitrate intoxication. The animals were treated and responded favorably. However, several days later the veterinarian was called back to the same farm and found that 4 pigs had died suddenly. Feed and water samples were sent to the diagnostic laboratory for analysis. Of 6 wells located on the farm, 4 shallow wells contained nitrate ion concentrations of from 20 to 50 times that normally needed to poison most livestock. The United States Public Health Service marks any water containing 10 p.p.m. KNO_3 equivalent or over unsafe for human consumption. These wells contained 480 p.p.m., 510 p.p.m., 200 p.p.m., and 205 p.p.m. KNO_3 equivalents, respectively.

Case 3: A feedlot containing 135 head

of cattle began using corn silage from a new upright silo on June 1, 1960. By June 5, 2 animals had died. The owner brought one of the animals to the diagnostic laboratory and gave the following history. On June 4, the animals moved with an unsteady gait, and all had nasal discharges. Coccidiosis had been diagnosed earlier, but treatment for this apparently had been successful. The owner reported having observed a dense, yellowish brown gas emerging from the corn silage soon after it had been placed in the silo. Quantitative analysis of the silage, however, revealed a nitrate ion concentration of 2.7% on a dry weight basis. After the ration was changed, no more cattle died and none of the animals showed the previous symptoms.

Nitrates become toxic when converted to nitrites in the foodstuff or the alimentary tract. Nitrites compete with oxygen, converting hemoglobin to a nonfunctional methemoglobin. It also has been found that they deplete vitamins A, D and E.

Nitrate poisoning can occur from agricultural chemicals containing salts of nitrite, such as nitrogen fertilizers, cereal grasses and weeds which accumulate nitrates under abnormal conditions, such as drought, dynamite and certain machine oils.

Three case histories are discussed in which nitrate poisoning was occurring from oat hay containing 6.0% nitrate on a dry weight basis, well water with 205 p.p.m. to 510 p.p.m. and corn silage with 2.7% nitrate on a dry weight basis.

Published with the approval of the director of the North Dakota Agricultural Experiment Station.

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The Pig, an Effective Carrier of Leptospira Canicola

The pig may be as effective a carrier of *Leptospira canicola* as the dog, 2 Scottish investigators have reported.

In a study of 16 cases of canicola fever in the Edinburgh area, 11 were found to be among contacts on 5 pig farms. Infections previously were found to exist 5 years ago in 2 of the piggeries and have been maintained through the years, probably as a result of external conditions favorable to the survival of the leptospires.

Joyce D. Coghlan, Ph.D., Lecturer in Bacteriology, University of Edinburgh, and John Norval, M.R.C.V.S., Chief Veterinary Inspector to the City of Edinburgh, explained that at the 2 farms first incriminated in human outbreaks 87% of the sera of the pigs were found to have antibody levels high enough to signify that active infection still is present in the herds.

Their observations indicate that the infection of a herd of pigs by *L. canicola* may be maintained for many years with the risk of human cases resulting from contact with the contaminated urine. This is especially apt to occur in young persons employed for the first time at work with pigs.

Although reinfection of these herds may have occurred from some outside sources during the time subsequent to the 1955 survey, the investigators believe it more likely that the infection has been maintained during the intervening period by passage from pig to pig. No infected dogs could be found as the possible source of infection.

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Part II

Problems Encountered in Pet Bird Practice

K. M. Friedburg, D.V.M.
General Practitioner
Three Oaks, Michigan

Tumors may be found very frequently in any part of the parakeet's body. Lipomas are common in the subcutaneous tissue of the chest area or in other areas below the skin. Most of them can be removed successfully. Intra-abdominal tumors are usually malignant and most of them involve the ovary or a kidney. Here the prognosis should definitely be guarded.

Surgery is usually accomplished by blunt dissection under an anesthesia of Equi-Thesin or diluted Nembutal. Special equipment to facilitate surgery consists of a magnifying lamp or a binocular loop for better vision. Also needed are ophthalmic catgut (4-0) or ophthalmic twisted silk (4-0) or fine Vetafil for skin suturing, No. 18⅜ circle suturing needle with cutting edge, a small pair of manicure scissors and small cotton tip applicators. The rest, such as mosquito forceps, scalpel with No. 10 or 15 blade, etc. are standard equipment. All instruments and equipment needed are held in readiness in order to keep the period of anesthesia as brief as possible.

Infectious Diseases

Pet birds are susceptible to such infectious diseases as Newcastle Disease, pullorum, fowl cholera, fowl typhoid, fowl pox, coccidiosis, psittacosis and many others. Psittacosis causes greatest concern because it is transmissible to human beings. The psittacosis virus is one of the larger viruses and is a member of a group of immunologically related viruses of both avian and mammalian sources. For instance, the virus of feline pneumonitis, mouse pneumonitis and bovine encephalomyelitis belong to this group.

There probably is a separate human pneumonitis virus within this group. However, there is no doubt that the greatest source of human psittacosis infection is derived from birds. Veterinarians should be especially careful. Human infection results from inhalation of virus liberated during the handling of infected birds, or during the preparation of birds such as chickens or turkeys for food purposes. Human symptoms may vary from a mild respiratory affliction to a severe and sometimes fatal pneumonia.

Birds may pick up the infection by ingestion and inhalation. In birds the cardinal symptoms of illness mentioned earlier are evident (listlessness, ruffled feathers, abnormal appetite, usually diarrhea, emaciation, weakness and coma). Additional symptoms which may be characteristic are fever, fast breathing, mucous secretions from the nostrils and eyes and a green or bloody diarrhea. A newly acquired bird with bloody diarrhea should always be suspected

of harboring psittacosis. The incubation period is from 15-60 days. The psittacosis virus is widely distributed in the internal organs and blood and is also present in the excreta. The liver and/or spleen are enlarged and are covered with multiple small abscesses under a serous coat. The lungs may or may not show evidence of pneumonia. In birds which recover, the infection often persists in a latent form and may result in carrier birds.

Treatment: It is possible that a newly acquired, apparently healthy bird may incubate or harbor the psittacosis virus. To protect the new owner (and the veterinarian) the following prophylactic feeding schedule will render the bird non-infectious. Mix 30 mg. of powder of any of the tetracycline compounds (Aureomycin poultry formula, American Cyanamide) or (Pfizer's Terramycin or Tetracycline Vet.) in ½ lb. of seed. Give this medicated feed for 2 days, then 1 day non-medicated feed, 2 days medicated feed, etc., for a total period of 23 days. The bird should then be free of the viral agent.

To eliminate the virus from already infected birds, or from suspected birds, the administration of 1 mg. or 2 mg. of a broad spectrum antibiotic, q.i.d. for 4 days is usually effective. It should be remembered that this treatment or the prophylactic treatment will not render the bird immune against the possibility of future infections, but due to its isolated existence as a household pet the chances of future infections are indeed remote.

French Molt

This is the premature shedding of the primary flight feathers and usually occurs in young birds. The bird is unable to fly and becomes known as a "creeper." The true cause is unknown. Theories have been advanced that it might be due to an abnormal fermentation of the crop milk or crop contents in the parent bird while feeding the young, or due to improper assimilation of food by the young, or even a genetic factor may be responsible. Usually a high protein, high vitamin diet or 1 mg. of thiamine HCl daily will help the bird to recover its full feathering at the next molt.

Ectoparasites

The most common ectoparasites are mites and lice. The scaly leg mite *(Cnemidocptes mutans)* causes considerable scale formation and intense itching on the legs, feet and toes and around the beak and eyes. The mite, similar to the sarcoptic mite in dogs or cats, spends its entire life cycle on the host. The mite eats connective tissue and its excreta accumulates as a fine white powder. In advanced cases, a toe or even a leg may slough off. It may also cause difficult prehension of food. The mite is very small. For microscopic identification, it is best to dissolve the skin scraping or debris with a 5% KOH solution. The adult mite has 4 pairs of legs and 2 long, hair-like processes extend posteriorly. A daily application of Polyderm (a solution of chlordane with benzocaine—Warren Teed) to the affected part has given good results. The perches and the cage should be cleaned 2 times weekly with a diluted solution of chlordane or Phostix (Fort Dodge), 1 oz. per gal. water.

The red mite or roost mite *(Dermenyssus gallinae)* is a nocturnal blood-sucking parasite that will cause a bird to be very uncomfortable, restless and finally anemic. A female bird may even abandon the nest and leave the babies at the mercy of these mites. If their presence is suspected, one should examine the bird, its equipment and surroundings for tiny, moving red or gray specks about ¾ mm. long (red color if engorged with blood — gray, not engorged). Mites reproduce rapidly and their life cycle may be completed within 1 week. Or one may cover the cage with a white towel or sheet in the evening and examine the underside of the towel in the morning, for the presence of mites. If found, the cage should be scrubbed and thoroughly cleaned in a

hot solution of chlordane or Phostix. The bird should be dusted with pyrethrum (powder reduced to 3% by the addition of talcum powder). DDT should never be used on these birds. It might be advisable to repaint the bird cage with Rust Oleum paint or any type of non-lead paint.

To treat for lice, the application of a 3% pyrethrum dusting powder is usually effective. A hand lens may be used to distinguish between lice and mites. Lice have 3 pair of legs, mites have 4 pair in the adult stage.

Fractures

Immobilization and apposition of the fractured parts is, of course, the prime objective. The bird is anesthetized or held by an assistant.

In fractures of the tibia and metatarsus, the leg is extended and several loops of narrow, cohesive gauze are firmly wound around the afflicted part. Cohesive gauze adheres only to itself and provides enough stability to immobilize the fractured portion.

Fractures of the femur must be handled differently since this part of the leg is enclosed by the skin of the abdomen and it is impossible to apply a direct cast. To provide immobilization, flex the leg forward and tape the leg to the body. A narrow piece of tape wound twice around the abdomen and the metatarsal portion of the leg will immobilize the femur. The metatarsal portion is held parallel to and just below the abdomen in an anterior direction. This is the most natural position. Both wings are left free by passing the tape underneath them.

Fractures of the wing are best treated by bandaging the afflicted part with cohesive gauze after cutting off the feathers over the fracture with a pair of scissors. The wing is then folded against the bird's side in its natural position and held in place by passing a narrow strip of adhesive tape 2 or 3 times around the wing and body. The healthy wing is left free and is not included under this bandage.

For all fractures, a cardboard collar is applied around the bird's neck to discourage the bird from picking. The collar is made from stiff paper or cardboard; a circle 1½ inches in diameter is large enough. A hole is cut out of the center just large enough to permit the head to slip through. The collar and the cast are removed 7 to 10 days later. All high perches are removed from the cage during the convalescent period.

Training a Bird

Quite often a client will ask how to train a parakeet. Parakeets are filled with natural curiosity and learn quickly. Given a few simple toys, they can be trained to push, pull or balance them. They even may be trained to acquire a vocabulary.

1. In teaching them you have to be smarter than the bird!

2. Be patient and considerate in your lessons. Do the training in quiet surroundings.

3. Only 1 person should train each bird. Teach only 1 word or trick at a time using the same voice pitch.

4. Stop when the bird loses interest. Have many short lessons a day rather than 1 long lesson.

5. Repeat this day after day, over and over again, until the bird has fully mastered the word or sentence or trick. Only then begin a new lesson.

Conclusion

Pet bird practice differs from other types of veterinary practice only in degree and magnitude. The veterinarian need only remember the basic principles and procedures of veterinary medicine and apply these to the anatomical and physiological differences of the bird. It is a real opportunity to provide a greatly needed service. Working with pet birds is also interesting, challenging and financially rewarding.

Small Animal Clinic

Non-Inherited Monorchidism

In *Veterinary Medicine,* 50:478, 1955, I reported an odd case of monorchidism in 2 dogs in the same litter. They were Redbone Coonhounds used in a nutrition study. They grew rapidly (fully grown in 7 months and 3 weeks). Both dogs had normal testicles, but near maturity they both drew up one testicle through the external ring where it remained permanently. They are now classified as monorchids. Because of his excellent quality and in order to further study the possible inheritance of this odd form of the physical defect, one of these hounds was mated.

There is no need to itemize here or in a bibliography the many reports which indicate that cryptorchidism is inherited as a Mendelian dominant trait and that is passed on through females in the same manner. If this monorchid condition described is hereditary, we should expect about one-half the males from each litter to be monorchids or complete cryptorchids.

After the first mating, when no cryptorchids were found, the dog was used repeatedly. Many female pups were raised, bred and their progeny also examined. Since puppies are born with testicles already descended, all of the male pups were regularly examined. The male pups from the litters of the dog's female offspring were also examined. In one case the dog was mated to his own daughter.

Results show that this monorchid male sired 13 litters of puppies, totaling 124 puppies, of which 69 were males and 55 were females. Five bitches sired by this dog have produced 54 puppies, of which 30 were males and 24 were females. There was not any degree of cryptorchidism or monorchidism in any of the puppies.

It would seem from these results that there is one form of monorchidism which is not hereditary. This form is one in which the dog is normal with regard to having had both testicles in the scrotum, but one has retracted and remains in the inguinal canal.

Leon F. Whitney, D.V.M.

Immediate Care Of Bone Injuries

A simple method for handling mandibular fractures for immediate immobilization is to tape the mouth shut. A couple of strips of tape over the nose immobilizes the mandibles until surgery and final immobilization.

This method is adequate for some premaxillary and maxillary fractures. In using this method it is assumed that a good examination has been performed. If there is oral hemorrhage it could create a problem due to blood aspiration. In premaxillary and maxillary fractures there is also the possibility of occlusion of the nares. This

can be eliminated by using a rubber tube taped in the mouth.

Immobilization, tempered with an understanding of the injury that is present, is the total case for immediate management. In the immediate immobilization it is necessary not to create further injury to the area.

Spinal fractures are relatively common in the dog. With spinal injuries, fractures, and injury to the spinal cord, because of of the proximity of the spinal cord, spinal shock is a definite problem. Immobilization of this area in suspected fractures or luxations is important. Improper handling of the animal during radiography or in emergency shock procedures can create further trauma on the spinal cord.

An orthopedic brace is useful for immediate immobilization. This brace has metal stays that run on either side of the spinal column.

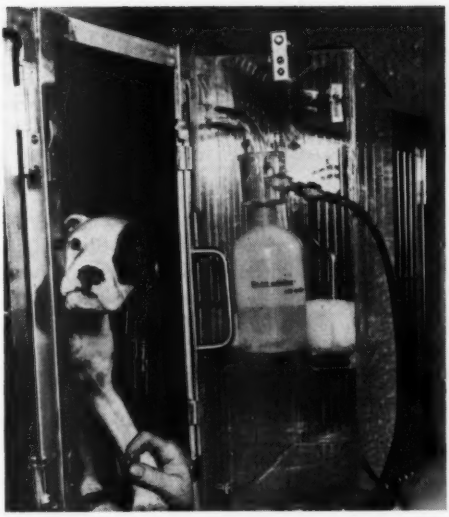
Long bone fractures are the most common problem. There are the 2 types, the simple and compound fracture. The compound fracture requires immediate attention. Antibiotic therapy should be started and the fracture reduced.

If the dog shows clinical signs of fracture, although the radiograph is negative, the dog should be treated as a fracture patient. Radiographic evidence is only an adjunct to diagnosis.

For fractures of the metacarpus, metatarsus and the carpal area, the metal spoon splint can be used. The spoon is padded with cotton, placed on the lower aspect of the limb, and a single strip of tape is wrapped around the splint, starting at the toes. Another splint that is used is the Thomas splint.

Immobilization of the fracture is of great importance. On long bone injuries, as long as the fracture is not immobilized, there is continued trauma. There is the possibility of laceration of the major nerve trunks or laceration of arteries or veins.

A.A.H.A. Meeting, 1961



This plexiglass panel is an "oxygen tent" that attaches to cage doors in animal hospitals to help small animals suffering from heat prostration, respiratory illness or shock. It is also equipped for spraying medication into the compartment. The NCG Division of the Chemetron Corporation supplies it to veterinarians.

Tranquilizers Aid Mink Management

The mink has an extremely nervous temperament and is greatly affected by various stimuli which would be accepted by other animals as part of their normal environment.. For example, mothers will destroy their entire litter if disturbed by a low-flying plane or some other animal around the cages. It is not unusual for valuable mink to ruin their fur while being transported or at an exhibition. Some also develop the habit of chewing fur. Young females are at times so high strung that it is impossible to mate them.

Therefore, a tranquilizer which produced nervous and psychic relaxation without impairing other facilities would be a

valuable aid for the mink rancher. Canadian researchers chose reserpine because it could be administered orally and would give the same action as by other routes. It also is rapidly excreted and has a wide margin of safety between active and toxic doses.

The optimum dose was found to be between 0.036 mg. and 0.05 mg. for oral administration of reserpine. Body weight did not influence the dosage. As much could be tolerated and was needed for a young kit as was needed for an adult. The effect of the medication appeared to be most intense about 10 to 12 hours after administration. One single day's treatment would alter the animal's behavior such that it would remain more sociable for a period of 2 to 3 weeks until provoked, when it would revert to the normal wild behavior.

Canad. Jour. of Comp. Med. and Vet. Sci., 243:24, 1960

Injectable Anthelmintic Removes Hookworms

Disophenol was effective in removing all the hookworms from 9 out of 12 dogs used in a study reported by Drs. F. R. Koutz and H. F. Groves of Ohio State University. It did not remove any other internal parasites. The drug appeared to be somewhat less effective against *Uncinaria stenocephala* than *Ancylostoma caninum*.

Disophenol was injected subcutaneously in the cerevical region at the rate of 0.1 cc./lb. of body weight (35 mg. Disophenol per cc.). The product did not produce any irritation at the site of injection nor was any reaction noted.

An increased number of hookworm ova was found the day following injection along with small pieces of disintegrated hookworms. The release of ova from disintegrating female hookworms may explain this increase in ova count.

Disophenol is a product of the American Cyanamid Company.

Speculum, 16:35 (Winter) 1961

New Drug Dissolves Cystic Calculi

Renacidin is a mixture of anhydrides, lactones, gluconic salts and esters, citric and malic acid. It was recently developed for use in human medicine to dissolve renal and cystic calculi.

A product such as this has long been sought for use in veterinary medicine, especially for removal of urinary calculi in the feline. Phosphate and oxalate urinary calculi have been a problem in cats. The narrow urethra of the tom or neutered male has particularly been a problem. There is a need for a product that will dissolve or reduce the size of cystic calculi.

In human medicine Renacidin is introduced with a 2-way catheter or periodically through an indwelling catheter to prevent plugging of the urethra. The following technic was adopted to cope with this problem in the cat.

Twenty-five grams of powdered Renacidin is added to 11 ounces of boiling distilled water. Then the solution is cooled. Affected cats are anesthetized, and the penis is extended by grasping with mosquito forceps. A tomcat catheter is introduced, and the sterile solution is forced through until the obstruction is dislodged. The catheter is then passed into the bladder, and the bladder is expressed. Using a 2-way valve, about 50 cc. of Renacidin is injected into the bladder and drawn off. This procedure is repeated until approximately 200 cc. of Renacidin solution has been injected. The final 50 cc. of solution is left in the bladder.

A liberal amount of fluids should be given the cat following this treatment and antibiotics when necessary. If straining occurs, antispasmodic drugs should be used.

Renacidin is a brand of hemiacidrin, manufactured by Guardian Chemical Corporation, Long Island City, N. Y.

The Veterinarian, 6:8 (No. 2) 1961

An Agent to Aid In Control of Pruritis

Francis T. Candlin, D.V.M.
Denver, Colorado

Pruritis can be caused by such a wide variety of conditions that the treatment of this symptom is one of the most challenging problems in small animal medicine. Of all the ailments that may afflict a dog, none is more annoying to the dog owner. It is not unusual for a client to remark, "I was awake half the night by his scratching," or "If he doesn't stop scratching, I'll go mad."

On the contrary, it is astonishing the number of pet owners who are unaware of the physical damage that can be self-induced by the dog through the mechanics of scratching. The trauma that is inflicted by this repetitive act (itch-scratch-itch cycle) seems at times to be poorly understood by our own profession. Most of the weeping lesions on a dog are self-inflicted, regardless of the underlying cause. No attempt will be made to discuss the multitudinous causes of scratching.

The primary purpose of this paper is to discuss the alleviation of itching by means of an oral antipruritic, trimeprazine (Temaril, Smith, Kline & French Lab.), a phenothiazine derivative possessing antihistaminic,[1] antiserotin[1] and antipruritic activity.[2,3,4,5] This drug has been combined with prednisolone in the proportion of 5 mg. of trimeprazine to 2 mg. of prednisolone.

During a period of 2 years, 254 dogs and 41 cats have been treated for a variety of skin diseases. These animals were selected particularly because scratching was one of the chief symptoms. The dogs ranged in age from 6 weeks to 14 years and the cats from 4 months to 11 years. Doses of trimeprazine were based upon the size of the animal and the severity of the scratching. A 25 lb. dog would usually receive 1 tablet every 8 hours. A 5 lb. to 10 lb. cat or puppy would receive ½ tablet every 8 hours. In very severe attacks the dosage was doubled. The duration of treatment varied from 2 days to 9 weeks. The average duration was 1 week. Concomitant therapy was used in each instance where the underlying cause was apparent (for example, external parasites).

Results were tabulated as follows: Excellent when all scratching was completely controlled; good when the animal was obviously relieved and only infrequently annoyed; and poor when there was only transient effect or no control. Most of these observations were made by the owners since all but 49 dogs and 13 cats were treated as out-patients. Excellent relief was afforded 68 (27%) of the dogs treated while 13 (31%) of the cats were afforded complete relief. One hundred and twenty-one dogs could be classified as receiving good relief (48%) and 22 cats (52%) could be similarly classified. The results were considered poor for the remaining 84 dogs (25%). Six cats (17%) were afforded poor relief of pruritis. Even though the reports from the owners indicated poor results in this group, it must be mentioned that 44 owners of dogs and 2 owners of cats in this

group repeated the treatment after stopping it from 1 to 3 weeks. It became evident that the animal owner was more aware of the results after cessation of therapy than while it was being used.

When the original prescription was exhausted, the animal soon returned to the itch-scratch cycle with all of his former vigor. The annoyed owner would then seek a new supply of the drug. The large percentage of refills (over 80%) is testimony as to the drug's effectiveness.

While the drug had no effect on the skin lesions *per se,* nevertheless it was apparent that in many cases there was a reduction in the need for concomitant therapy. The healing time was reduced in most lesions because repair was not retarded by constant irritation. Side effects were minimal. Drowsiness was the most apparent side effect; however, it was considered to be an advantage by most of the pet owners.

Summary

Trimeprazine with prednisolone provided effective relief in 75% of the dogs and 83% of the cats suffering from pruritis in this study. The drug was effective regardless of the cause of scratching. It often relieved itching when all other therapies failed.

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Ear-Trimming Technics

Earl A. Williams

This is an abstract of an article published originally in The Southeastern Veterinarian, 12:16, Winter, 1960. The author is a senior student, School of Veterinary Medicine, University of Georgia, Athens, Ga.

Ear-trimming or ear-cropping is a surgical technic that involves reducing the size of the ear and often changing the conformation of the ear to suit the desire of the owner, to meet certain breed standards or simply to make the ears stand.

Proper age for ear trimming varies even within the breed, but the following suggestions are recommended. The best age for Great Danes, Dobermans, and Boxers is 10 or 11 weeks. For some smaller breeds, such as the Boston Terriers, Bull Terriers and Toy Manchesters, 4 to 6 months is recommended. In any case, trimming should not be performed until the ear develops enough cartilage and muscle to support it properly.

It is unwise to attempt any ear-cropping if the animal is undernourished or in poor health.

Sex of the animal, the shape and size of the head, the shape, length, and weight of the ears, and the breed involved, must be taken into consideration in order to determine the exact curvature and length of the finished ear.

Ear standards are established by the American Kennel Club on the following breeds:

1. **Great Dane:** The ears should be high, not too far apart, medium in size, of moderate thickness, and droop forward close to the check. The top line of the folded ear should be about level with the skull.

2. **Boxer:** The ears should be set high, clipped to a point, fairly long, bell not too broad and carried perpendicularly.

3. **Doberman Pinscher:** The ears should be well trimmed and carried erect. The upper attachment of the ear, when held erect, should be on a level with the top of the skull.

4. **Staffordshire Terrier:** The ears may be cropped or uncropped, the latter preferred. Uncropped ears should be short and held half rose or prick. The full cropped ear is penalized.

The various technics of ear-trimming can be broken down into 2 major headings: the free-hand methods and the instrument methods. The free-hand methods are actually variations of one basic type.

The first involves the simple basic technic that is used by the majority of practitioners when they wish to accomplish the simple straight or curved ear trim (Figure 1). The outer ear surfaces are opposed, and the anterior margins are marked by nicking or by placing adhesive tape in the desired locations. The base of each ear is marked in a similar manner. With an ink pen or a marking pencil, the 2 opposite marks are joined either by a straight or a curved line drawn on the inner surface of each ear. Desired traction is then applied to each ear in turn and they are cut. This type of trim can be used in all breeds whose ears are more commonly trimmed for the pleasure of the owner or show purposes.

Fig. 1. Basic free-hand method.

The second involves a variation of the first free-hand method described above (Figure 2). The anterior surfaces and bases of the ears are opposed and marked. A straight line is then drawn to join the opposite marks on the inner surface of each ear. This line is cross-marked at its halfway point. Each half is cross-marked to make quarters. At the uppermost quarter mark, approximately ⅛ inch is measured from the line anteriorly and marked. At the lowermost quarter mark, approximately ⅛ inch is measured from the line posteriorly and marked. The incision line is drawn to include the anterior margin, the 2 quarter marks, the halfway mark, and the base mark. This incision line, when cut out, will provide an evenly

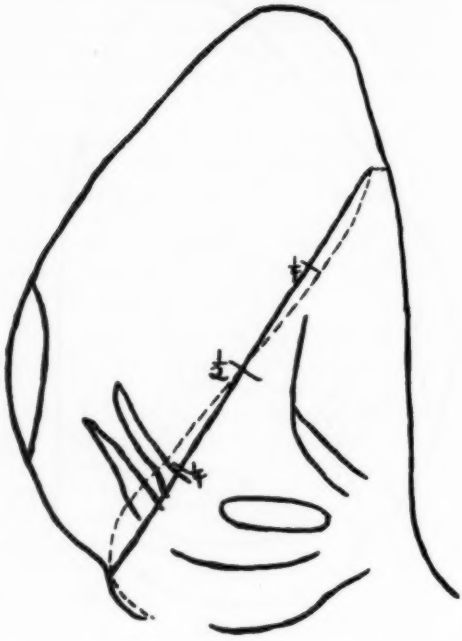

Fig. 2. Variation of method shown in Fig. 1.

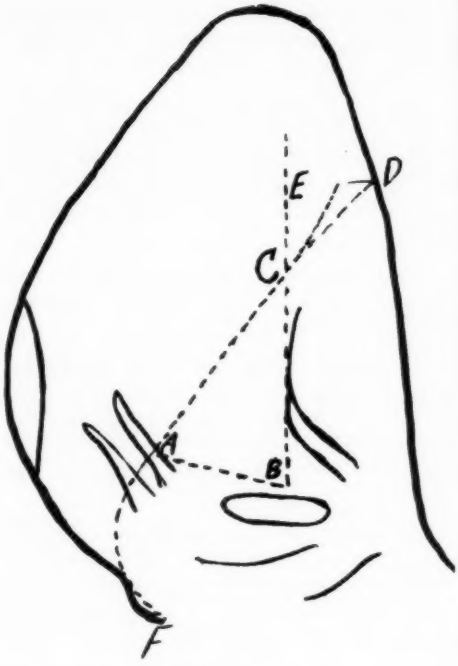

Fig. 3. Triangulation method.

curved ear surface. This curved ear pattern is commonly used on Boxers, and Great Danes that are to be used for show purposes.

The third of the free-hand methods is known as the triangulation method. This method has been used extensively on the Doberman and the Boxer. Their ears are easily cut to the desired two-thirds of their original length.

The procedure involves marking the inner surface of the ear with a series of lines to form the desired triangle (Figure 3). Point F is determined by finding the inner surface of the parallel ridges just above the base of the ear. Point B is formed at the intersection of the horizontal and vertical ridges directly opposite point A. Line AB is then drawn, forming the base of the triangle. Line BC is then drawn forming the right angle of the triangle. The remaining line from point F through point A and C to point E is drawn, forming the hypotenuse of the triangle. The line, FA, forms the width of the bell of the finished ear. Line DE is determined by extending point E parallel with line AB to point D.

The procedure of making the actual incision is similar to the previous methods described. The cut is started at point F, extended to point A, and then upward toward point C. As point C is approached, a gradual sweep is made through point C to point E, where the cut is terminated. Point F is extended to point A and then upward toward point C. The square tip, DE, in this particular method is left intact by terminating the main cut at point E. It has been found that the square tip helps to hold the ear erect by allowing for more even scarring at this point.

The remaining skin edges are opposed and sutured starting at the tip. This method

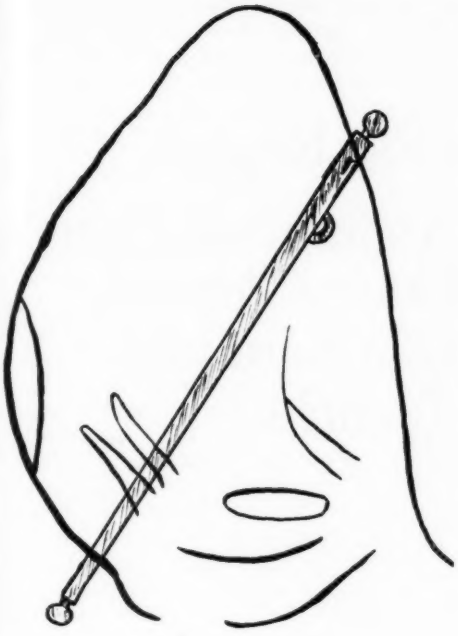

Fig. 4. Instrument method.

is recommended in order to pull the loose skin taut at the base of the ear, making an even apposition. This procedure can be used in all breeds that require a wide bell with an even straight sweep.

There are various designs of instruments on the market at present that can be used for ear-trimming. Some involve the use of clamps with straight or curved edges with or without a cutting edge attached to the instrument.

It is argued that this method is more advantageous than the free-hand methods because the factor of human error is removed. Also the excessive trauma from secondary trimming after the initial cut is eliminated.

The ear is marked as was previously described and the instrument is placed over the ear in the desired position (Figure 4). The ear is pulled, anterior to posterior, firmly until the edge of the tape is exposed in the upper end of the instrument. If more curvature is desired at the sweep, more of the ear may be pulled through the instrument to the desired position.

With the ear held firmly in the trimmer, the cutting edge is pulled through the trimmer from one end to the other. The rough edges of cartilage at the base are trimmed with scissors as desired.

If a wider base on the ear is desired, as in some Dobermans or Danes, the trimmer is held farther away from the base of the head. After the cut is made, the base is blended with the rest of the ear with scissors.

This procedure may be easily adapted to all the breeds whose ears are commonly trimmed by the practitioner.

Taping Ears

There are various methods of securely taping the ears in a fixed position following trimming to insure proper results in carriage. As a general rule, the procedure of taping involves placing the ears in gauze and adhesive tape for 4 to 8 days following surgery. During this time the animal should be kept away from littermates or other animals. At approximately 6 to 8 days the gauze and tape are removed, and the ears are placed in some type of fixed bandage or frames for approximately 4 days.

These fixed bandages may be in the form of a roll of cotton placed between the ears with the ears taped to the roll. In common usage is a method of taping each ear separately and placing a stiff adhesive between each. Another method involves rolling the ears into a cone shape, slanting them laterally and taping as required. Still another method is the use of frames of aluminum shaped to the desired size and taped between the ears. There are many newer types of fixed bandages on the market that can be used on newly trimmed ears. They are of value in both initial ear-trimming and corrective ear-trimming.

Case Report:

Abdominal Pain Due to Torsion Of a Retained Testicle

N. E. Eskew, D.V.M.
E. F. Kuhn
Florissant, Missouri

Abdominal pain is evidenced in such a variety of conditions that accurate differential diagnosis often becomes quite perplexing. This report is concerned with an unusual cause of abdominal pain, which eventually required exploratory surgery to specifically diagnose.

The patient in question was an 8-month-old monorchidic boxer. On preceding visits for routine vaccinations and ear cropping, the patient had appeared healthy.

The history provided by the owner was extremely vague. Only after a neighbor's insistence that the patient had "distemper," did the owner present him for examination. The patient had become somewhat lethargic on the preceding day. Its appetite was mildly diminished. There had been no

passage of feces in the preceding 24 hours; however, there had been no signs of tenesmus. The diet consisted of commercial dog food with a vitamin-mineral supplement. It had not been changed prior to the onset of illness.

A routine physical examination disclosed normal rectal temperature, respiration, heart rate, pulse, color of mucous membranes, appearance of eyes, and lung sounds. The patient walked with a slight stilted gait and was much less aggressive than on previous visits. The patient demonstrated severe abdominal pain when abdominal palpation was attempted. Resentment to palpation was so acute that it was difficult to specifically isolate the area of greatest discomfort. However, by gradual manipulation a firm mass was located in the dorsum of the left posterior quadrant of the abdomen. Permission was granted to retain the patient for observation and radiography.

Examination

The first procedure was to anesthetize the patient with 5% thiamylal sodium (Surital, Parke, Davis & Co.) to facilitate additional palpation. This still did not help to provide a conclusive diagnosis, so an abdominal screening radiograph was exposed. This was followed by a second exposure 2 hours after the administration of a barium meal. The radiographs disproved the suspicions of a foreign body or intussusception. A small mass approximately 6 cm. to 8 cm. in diameter was visible just dorsal to the urinary bladder but could not be specifically identified. The possibility of a neoplasm was considered, but it seemed unlikely that it would cause such acute and severe pain. Urinalysis produced normal findings in all respects. After conference with the owner as to the inconclusive findings, consent was given for exploratory surgery.

Presurgical sedation consisted of morphine-atropine administered intramuscularly 30 minutes prior to surgery. Surgical anesthesia was effected by using 5% thiamylal sodium and 5% pentobarbital sodium (Nembutal, Abbott Lab.) mixed as equal parts and administered intravenously to effect. The patient was prepared for aseptic surgery in routine fashion and draped for midline incision. The midline incision extended from the umbilicus to just anterior of the prepuce. After the intestine had been packed off with sterile, saline moistened toweling, the mass was easily located and delivered through the incision.

The mass was found to be the retained testicle which had undergone a 180 degree torsion at its attachments. This torsion had not been sufficient to inhibit arterial blood flow to the testicle but had prevented the venous outflow. Consequently, the testicle and its tunics had become engorged and greatly distended with blood. This accounted for the increased size and severe pain which had been evidenced.

After ligation of the existing vessels, the engorged testicle was easily removed by cutting the attachments. The abdomen was closed in a routine manner using 00 chromic catgut for peritoneum and fascial layers. Monofilament nylon was used to close the skin incision.

The patient was discharged on the day following surgery. At this time the abdomen could be freely palpated without the slightest discomfort. Incision healing was uneventful, and the skin sutures were removed 5 days postoperatively following first intention healing.

Histological examination of the removed testicle by Dr. L. D. Kintner of the University of Missouri did not show any neoplastic changes. The testicle was hypoplastic and underdeveloped because of retention.

Summary

This case report of severe abdominal pain and the difficulty of diagnosis points out the value of exploratory surgery. A retained testicle that had undergone 180 degree torsion was the cause of the pain and uneventful recovery followed removal.

Medical Interchange

Notes and abstracts screened from the medical literature for their special interest to veterinarians by Lynn Stratton Morris.

Fluorescent Stain Aids in Fungi Detection

Acridine orange can be used as a fluorescent stain for a rapid and simple method to demonstrate fungi in tissue sections, smears and fresh preparations.

Staining technics used for tissue sections, fresh preparations of fungi and slide cultures are described by Dr. Ernest W. Chick, associate in Pathology, Duke University School of Medicine, Durham, N. C.

The usefulness of the acridine orange fluorescent stain for fungi lies primarily in its simplicity. It can be used on smears or paraffin-embedded tissues which have been fixed by a variety of methods. The technic is simple, quick and requires no differentiation or rigid timing.

Any compound microscope and light source can be adapted for fluorescent work utilizing blue-violet light. Filters can be obtained for less than $30 from most optical supply houses. This apparatus is quite adequate for routine uses, thus making it practicable in office practice without the expense of special fluorescent microscopic instruments.

The examination of yeast phase fungi as fresh preparations reveals a variety of intracytoplasmic structures which are not easily visualized with other routine staining procedures.

In addition to its potential usefulness in the study of the structure and morphology of fungi, the acridine orange stain can be combined with potassium hydroxide to provide a rapid means of scanning skin scrapings and hair for the presence of fungi. With this method many of the problems of traditional KOH preparations are overcome.

Arch. Dermatol. 83:305-309, February, 1961

Anatomical Reason Supports Emphysema Theory

A comparative study of sub-gross pulmonary anatomy in 7 individual mammalian species and man has revealed marked anatomic differences, suggesting the possibility of equally marked differences in function and potential pathology. Species studied included the cow, pig, lamb, dog, cat, monkey and horse.

A significant finding was that only in the lung of man and the horse does the bronchial artery provide blood directly to the alveoli. This lends indirect but strong support to the theory that emphysema can result from disease of the bronchial artery.

Using the bronchial artery theory as a basis for experimentation, the investigators were able to produce in a normal horse a condition identical both to naturally occurring equine and human emphysema.

The study was conducted by Richard F. McLaughlin, Jr., M.D., clinical instructor, Department of Medicine, University of California Medical Center, San Francisco; Walter S. Tyler, D.V.M., Ph.D., assistant professor, Department of Anatomy, School of Veterinary Medicine, University of California, Davis; and Capt. Robert O. Canada, M.C., U. S. N., chief of medicine, U. S. Naval Hospital, Bethesda, Md.

Fifty-two pairs of normal lungs taken from the 7 mammalian species and man were studied. A tabulation of the data obtained from the specimens permitted them to be grouped into 3 distinctive sub-gross lung types (see Table 1). Comparisons were made on the basis of degree of lobulation, pleural morphology, arterial supply to the pleura, general bronchovascular relationships, intrapulmonary termination of the bronchial artery, character of the distal airway, and presence of normally occurring bronchial artery-pulmonary artery anastomoses.

A number of naturally occurring bronchial artery-pulmonary artery anastomoses were found in lung Types I and III; none in Type II. The investigators noted that in human lungs these anastomoses were present not only in peribronchial and bronchiolar tissues, but also in the pleura.

Intralobular air drifts must be all but non-existent in lungs of Type I, in view of their nearly perfectly formed secondary lobules and heavy septa. Because of incomplete lobularity, which is critical for this process, air drifts probably are existent in the horse much as in the human being and, in contrast, existent to an immense scale in lungs of Type II where lobules and septa are absent.

The horse is the only animal commonly known to develop chronic generalized pulmonary emphysema in the form similar to that seen in man. This finding was reconfirmed during the course of a thoracotomy on what was originally thought to be a normal horse; the lungs were found to be emphysematous. An entire apex was removed as a biopsy specimen. Pathologic examination demonstrated this process to be grossly and histologically identical to the human variety.

TABLE 1

Subgross Lung Types Found in 7 Mammalian Species and Man

Subgross Type	I Cow, Sheep, Pig	II Monkey, Dog, Cat	III Horse, Man
Lobulation	Extremely Well Developed	Absent	Imperfect Development
Pleura	Thick	Thin	Thick
Arterial Supply to Pleura	Bronchial Artery	Pulmonary Artery	Bronchial Artery
General Bronchovascular Relationship	Pul. vein close to bronchus from periphery to hilum	Pul. vein follows independent course from periphery to hilum	Pul. vein near bronchus at periphery, apart at hilum
Intrapulmonary Termination of Bronchial Artery	Distal Airways	Distal Airways	Distal Airways and Alveoli
Terminal Bronchioles	Infrequently Observed—Extremely Poor Development	Absent Present—Very Well Developed	Present Present—Poorly Developed
Bronchial Artery-Pulmonary Artery Shunts	Present—Not, however, demonstrated in the pig	Not Demonstrated	Present

The long controversy over the normal occurrence of bronchial artery-pulmonary artery anastomoses might at least be partially clarified by considering their existence to be species-dependent. Such anastomoses have not been found in rats or in dogs; failure to demonstrate them in one or another species does not conclusively deny their existence in that species, but is highly suggestive.

Previous attempts to produce emphysema were unsuccessful, it is suggested, because the various experimental animals used did not possess lungs anatomically similar to those of man, nor naturally subject to the disease in a form similar to that in man.

Jour. Am. Med. Assn., 175:694-697 (Feb. 25) 1961

Human Hepatitis Traced to Animals

Soviet investigators suggest that animals may serve as reservoirs and sources of infection of viral hepatitis.

Prof. A. Shubladze and Dr. V. Ananyev, both of Moscow, said that cases of human infection with hepatitis virus isolated from dogs and sheep have been reported. The course of the disease in human beings varied, but it was particularly severe in the animals. Viral hepatitis also appears widespread in horses, although no definite evidence of its transmission to man has been established.

Difficulty in isolating and identifying the virus has been one of the major problems in establishing the relationship of the disease between animals and man. The investigators have used the usual serologic tests based on hemagglutination reactions, as well as a rabbit eye test consisting of the neutralization by convalescent serum of virus introduced into the anterior chamber.

Isolation and identification of the organism appears to be easiest at the onset of the disease, especially during the prodromal period. Since the disease is comparatively difficult to diagnose in its early stages and since contacts and carriers cannot readily be identified, the spread of infection is facilitated.

Virus propagation in tissue culture has not yet been achieved. Control of the disease therefore depends on the earliest possible diagnosis and widespread administration of human gamma globulin.

Med. Trib., (March 20) 1961

Rare Fungal Skin Infection Diagnosed in Hunters

A fungal skin infection, previously seen only in animals and never before reported in this country, has been diagnosed in 4 men who handled the carcass of an infected deer during last fall's hunting season.

In these few cases the infection appeared to be self-limiting and was responsive to penicillin. The report was presented by Dr. Victor Tompkins, director of the New York State Department's Division of Laboratories, Albany.

In Africa the disease in animals is known as streptotricosis or Senkabo skin disease. It is called Uasin-Gishi skin disease in the Orient, lumpy wool disease in Australia and strawberry foot rot in Scotland.

Presence of the disease in the United States was discovered when 2 State Conservation Department game protectors noted unusual lesions on the lower legs of a deer that had been shot in the Catskills. The carcass was sent to the Health Department's Veterinary Medicine research laboratory. Department mycologist, Morris Gordon, Ph.D., prepared cultures from the lesions and identified the organism as dermatophilus.

Meanwhile, the Conservation men who handled the deer and the hunters who had shot it developed small follicular lesions on their hands and forearms. Cultures revealed the presence of dermatophilus.

Med. Trib., 2:3 (Feb. 13) 1961

Veterinary Professional Conduct

A. H. Quin, D.V.M.
Kansas City, Missouri

The broad dictionary definition of ethics as "the science of moral duties," "the science of ideal human character," or "that which relates to moral action, motive or character" applies to all men whether they be bankers, farmers, laborers or professional men. Each day all men are called upon to make decisions in which their innate sense of honesty, their conscience and their willingness to practice the Golden Rule guide their relationships with others.

Under ethics the dictionary also defines the word as "conforming to professional standards of conduct." So far as veterinarians are concerned, ethics is first the privilege and secondly the application of daily disciplines for yourself in your relationships to your clientele, to your professional colleagues and to the general public. Also many of these responsibilities are responsibilities under law and licensure as well as under your own principles or code of professional ethics.

The 3 primary or learned professions are theology, law and medicine. All ethical offshoots of orthodox medicine, the surgeons, the nurses, the dentists and the veterinarians are, in essence, bound by the same basic concepts of ethics as the mother profession of medicine.

It has been properly written that acquiring a degree and the qualification to practice a profession should not be regarded as a legalized right, but rather as a privilege. Men and women who have reached professional status must realize that their education and the wisdom it has given into their hands are in trust only, and that trust must be repaid in service. Only in conscientious effort, to the best of our abilities can we justify that trust, especially to those who suffer and whose mouths are dumb . . . ethics call on the bearer to keep always in mind his duty, his self-respect, and his conscience, in fulfilling the life he has chosen.[1]

The dean of one of our veterinary schools once stated that a proper indoctrination in veterinary ethics must start while the future practitioner is still wearing diapers as a 2-year-old. If he is raised in a home without being taught respect for the rights of others and if his father is a sharp dealer who will wink at minor law infractions and go for shady deals, he will likely go through veterinary college and on into practice with the selfish ethical standards his father taught him rather than what he was taught in school. There is concensus that the usual rather abridged course in ethics and jurisprudence taught at veterinary schools is inadequate. Sometimes in the past the course has been tossed to a junior faculty member because none of the leading professors had time to teach it. What could be more wrong? Every faculty member, regardless of his department, should be made to understand that the obligation for his pay check includes the day to day indoctrination of his students

with proper viewpoints of professionalism and the importance of applied ethics.

Probably all have read, or should have read, a copy of the A.V.M.A. code of ethics. It covers only 2 printed pages of 34 specific paragraphs. A few of its highlights are:

It is unethical to take over a case, whether an individual animal, herd or flock, without asking the owner whether or not he has discharged the veterinarian first in attendance.

It is unethical for a veterinarian to belittle or injure the professional standing of another member of the profession or unnecessarily condemn the character of his professional acts.

If called into consultation by an attending veterinarian, findings and discussions with the client must be made in such a manner as to avoid criticism of the attending veterinarian by his client. This applies to state, federal and commercial house veterinarians as well as to practitioners. And, further, no consultant shall revisit the patient or client or communicate directly with the client without the knowledge of the attendant veterinarian.

Advertising of any and all types is a breach of ethics. The only exception is placement of a standard professional card in the home town newspaper. Box type or bold type listings in telephone books or large display office or hospital signs are not ethical.

It is not ethical for a veterinarian to appear on radio or television broadcasts on his own solicitation and identified on the broadcast to his own hospital. Radio or television broadcasts by veterinarians with the approval and/or sponsorship of the local veterinary medical association are entirely ethical and are to be encouraged

It is unethical when employed by the buyer to inspect an animal for soundness, to accept a fee from the seller. The acceptance of such a fee is *prima facie* evidence of fraud.

It is unethical to issue false health certificates on official documents and the violator, on proof, should be debarred from membership in all of his professional societies.

What can be done about a veterinarian who is willfully guilty of a breach or breaches of professional ethics? Experience has shown that the best corrective approach is to have a group of 3 respected veterinarians outside his own territory call on him and frankly discuss his transgressions. They should leave their war bonnets at home, hold their tempers and reason with him on a basis of fairness to all parties concerned. If the transgressor refuses to cooperate, he should then be debarred from membership in all veterinary societies and, further, this action should be called to the attention of the state veterinarian, the examining board and all veterinarians of the state through their official journal.

There is nothing quite so disgusting as 2 veterinarians in the same town having a feud. Such a state of affairs drastically lowers the respect of all farmers and townspeople for both of the individuals concerned. It also generates a reaction of mild disgust and the conviction that the quarreling individuals are selfish and professionally immature. If a veterinarian does not agree with his colleagues, he should not show these feelings to other people.

Graduate veterinary medicine in the United States is still less than 100 years old and there are men today who remember when quacks and empirics outnumbered graduate veterinarians 3 or 4 to one. As a young profession we still have a big job to do in attaining full public recognition. There is nothing to prevent the veterinary profession from becoming the most ethical of all professions. This can occur only if each individual veterinarian does nothing more than minimize selfishness and apply the Golden Rule.

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Anthelmintic Activity of Ruelene Administered to Cattle Orally and Topically

Harry Herlich, M.S.
Dale A. Porter, Sc.D.
Robert S. Isenstein, B.S.
Auburn, Alabama

The organic phosphate compound, 4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate (Ruelene), has been shown[1] to be safe and highly effective against *Cooperia punctata* when given to cattle at a rate of 39 mg./kg. of body weight. No information was provided on the action of the drug against other nematode species. Trials with sheep have indicated,[2] however, that the material is active against *Ostertagia* spp., *Trichostrongylus axei, T. vitrinus* and *Nematodirus spp.* at a rate of 200 mg./kg. Although the drug was well tolerated by these sheep, another group of investigators subsequently reported[3] gross signs of intoxication in sheep treated with this material at the same dose rate.

A formulation of this compound has been prepared for topical application to control cattle grubs, and it has been reported[4] to have some anthelmintic activity also when used in this manner.

This report summarizes the results of a small series of critical tests in which the compound was administered orally or applied topically to steers.

Experimental Results

The experimental procedure was essentially as described by Swanson *et al.*[5] except that all steers were killed 6 days after treatment. For oral administration, a 25% wettable powder (Dow M-1261) was given by drench at rates ranging from 10 mg. to 60 mg. of active material per kilogram of body weight. For topical application, an emulsifiable preparation (Dow M-1609) was diluted 1:1 with water and poured along the dorsal midline of the steers at a rate of 75 mg./kg. All 14 steers were naturally infected grade Jerseys ranging in age and weight as shown in Tables 1 and 2.

The efficacy of the orally administered drug against 6 species of gastrointestinal nematode parasites is shown in Table 1. At 40, 50, and 60 mg./kg., the drug was very effective against *Haemonchus placei, C. punctata* and *Oesophagostomum radiatum.* At the highest dosage level it was also active against *O. ostertagi, T. axei* and *T. colubriformis.*

There was no evidence of toxicosis in any of the animals that were given dosages of 10 to 50 mg./kg. One animal (1614) given 60 mg./kg. went completely off feed, began to scour and became excessively lachrymose about 6 hours after treatment. The following day these toxic signs were still evident, and the animal became listless. Fifty-six hours after treatment, the calf was killed *in extremis.* No abnormalities were found at necropsy. The rapid onset of signs

TABLE 1

Anthelmintic Activity of Ruelene Administered Orally to Cattle in 4 Different Dosages

No.	Animal Wt. (lb.)	Age (mo.)	Dosage (mg./kg.)	Worms eliminated after treatment					
				H.p.	O.o.	T.a.	C.p.	T.c.	O.r.
1572	283	16	10	299	747	0	0	0	108
1585	245	9	10	0	0	0	0	0	0
1573	460	15	40	4	5,153	0	28,399	0	116
1580	373	11	50	0	9,165	0	18,508	0	42
1610	195	7½	50	8	8,282	0	16,949	13,183	18
1614	185	8½	60	12	9,111	0	9,336	1,667	0
1601	325	13	60	826	0	8,243	27,878	0	320
1615	260	11	60	994	0	17,277	19,879	0	828
				Worms recovered at necropsy					
1572				1	9,300	3,600	5,500	0	114
1585				0	17,700	0	10,000	0	3
1573				0	15,840	2,720	1,400	0	2
1580				0	10,530	0	0	0	2
1610				0	79,080	0	0	1,240	2
1614				0	2,105	0	0	0	0
1601				0	0	2,080	0	0	0
1615				0	0	420	0	0	0
				Percentage of efficacy					
1572				99	7	0	0	....	49
1585				....	0	....	0	....	0
1573				100	25	0	95	....	98
1580				....	47	....	100	....	96
1610				100	10	....	100	91	90
1614				100	81	....	100	100	....
1601				100	....	80	100	....	100
1615				100	....	98	100	....	100

H.p. = *Haemonchus placei;* O.o. = *Ostertagia ostertagi;* T.a. = *Trichostrongylus axei;* C.p. = *Cooperia punctata;* T.c. = *T. colubriformis;* O.r. = *Oesophagostomum radiatum.*

TABLE 2

Anthelmintic Activity of Ruelene Applied to Cattle Topically at a Rate of 75 mg./kg.

No.	Animal Wt. (lb.)	Age (mo.)	Worms eliminated after treatment				
			H.p.	O.o.	T.a.	C.p.	O.r.
1669	390	14	...	1,088	0	36,045	18
1674	285	14	312	936	0	7,374	23
1659	285	15	....	0	200	400	6
1651	350	16	....	0	0	393	6
1673	355	13	..	199	0	13,882	75
1639	460	19	197	636	294	4,891	128
				Worms recovered at necropsy			
1669			....	5,080	1,640	10,800	170
1674			0	4,720	2,040	15,600	460
1659			....	400	1,860	0	0
1651			....	440	2,420	600	1
1673			....	1,040	880	27,600	14
1639			0	2,660	17,105	2,760	15
				Percentage of efficacy			
1669			....	18	0	77	10
1674			100	17	0	32	5
1659			....	0	10	100	100
1651			....	0	0	40	86
1673			....	9	0	34	84
1639			100	19	2	64	90

H.p. = *Haemonchus placei;* O.o. = *Ostertagia ostertagi;* T.a. = *Trichostrongylus axei;* C.p. = *Cooperia punctata* and *C. oncophora;* O.r. = *Oesophagostomum radiatum.*

characteristic of organic phosphate poisoning and the rather small number of worms harbored by this steer indicate that death was caused by the drug. The other 2 steers that received 60 mg./kg. were diarrheic on the second and third days after treatment; no other signs of toxicity were observed.

The activity of the topical preparation against 6 species of gastrointestinal nematode parasites is shown in Table 2. It is evident that the material had little or no effect on *T. axei* and *O. ostertagi* and that it was extremely erratic in its activity against *Cooperia* spp. *(C. punctata, C. oncophora)* and *Oes. radiatum.* The regimen was uniformly effective against *H. placei.* None of the animals evinced any symptoms of toxicosis.

Summary

In limited tests with Ruelene, administered orally to cattle at dose rates of 40 to 60 mg./kg., there was anthelmintic activity against *Haemonchus placei, Cooperia punctata* and *Oesophagostomum radiatum.* At 60 mg./kg. it was active also against *Ostertagia ostertagi, Trichostrongylus axei* and *T. colubriformis;* but since this dosage was lethal to 1 out of 3 steers, the toxic effect of the chemical on cattle requires additional investigation.

Topical application of the material at a rate of 75 mg./kg. resulted in erratic activity against *C. punctata, C. oncophora,* and *Oes. radiatum,* and there was little or no activity against *O. ostertagi* and *T. axei.* The regimen appeared, however, to be effective against *H. placei.*

From the Regional Animal Disease Research Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Auburn, Ala.

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The Ingested Foreign Body

The ingested foreign body presents no immediate serious threat to the patient, Dr. George N. Scatchard and associates from Children's Hospital, Buffalo, N. Y., have reported.

If the foreign object is in the esophagus, mineral oil or any similar lubricant (American oil, liquid petrolatum routinely is used) is given to help pass some of these objects into the stomach. The patient may be spared anesthesia and instrumentation. If the oil is unsuccessful, endoscopy is performed.

Once the object is in the stomach, sufficient time is allowed for it to pass spontaneously. A month is not too long. If the foreign body persists in the stomach, one should be alerted to a possible anomaly.

When the object has passed the pylorus, it may be arrested only on 2 counts: It may be too long to navigate the short arc of the duodenum, and if such is the case and the foreign body lands in a fixed position in the duodenum for a few days (as determined by *x*-ray), it should be removed. Objects beyond the duodenum that remain in one area indicate an underlying anatomic anomaly which needs correction.

Objects in the rectum should be permitted to pass without digital interference to avoid perforation.

The conclusions are based on a review of 600 cases at Buffalo Children's Hospital and a detailed study of selected patients who had unusual delay in eliminating the foreign body from the digestive tract.

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Vitamin A in Beef Cattle Rations

A. L. Neumann
Professor of Animal Science
Urbana, Illinois

The vitamin needs of ruminants have received relatively little attention from research workers in the past 2 decades. This is true especially for the fat-soluble vitamins A and D.

After Guilbert and Hart of California published their requirements for vitamin A or its precursor, carotene, and ruminant nutritionists found that it was rather difficult to compound a ration which did not meet these requirements, interest in this vitamin was virtually dropped. For years, however, reports from the field concerning certain droves of steers which were not performing up to expected standards persisted. Upon reflection, cases with obvious vitamin A symptoms occurred more frequently than one would expect. The usual explanation in these cases was that the cattle must have had low vitamin A liver stores due to a drought in their area of origin. Occasionally, the ration being fed was incriminated, in which case corn or weathered hay was often at fault.

That the problem of meeting the vitamin A requirements of beef cattle is not so simple, or that the incidence of deficiencies of this vitamin is not rare, surely can be attested by the increase of trouble from the field.

Signs of Vitamin A Deficiency: A gradual and almost unnoticed reduction in feed intake, followed by an unnoticed reduction in the rate of gain, generally precedes the more obvious symptoms of avitaminosis A. These 2 effects are most likely to escape the attention of the cattle feeder when cattle are being fed on self-feeders. The feeder may not be filled more than once weekly and the cattle receive only the most casual inspection.

If hand feeding is practiced, it may suddenly be noticed that the cattle are off feed for reasons which are not obviously apparent. This easily can be the result of just a few steers eating considerably less of their proportionate share, leaving more for the remaining steers than they are accustomed to eating. More careful examination will reveal dead hair coats, listlessness, lachrymation and even cloudy corneas. In more advanced cases, edema in the feet, lower legs, hocks, knees and in the brisket is noted. A soreness in the feet and a painful gait, not unlike a light case of founder or foot rot, is often observed.

A condition, which lately has been noted frequently but seldom is reported in the literature, is one that can be generally described as a looseness in the joints and cartilaginous regions. This is most obvious in cases where a severely wing-shouldered condition is present. Hocks and ankles which snap or flip when the cattle are

moved are other signs of this condition. Upon strenuous movement, such as in sorting alleys, severely A-deficient steers sometimes faint, fall to the ground and lie quivering nervously before arising in a few minutes. This condition is brought on by the increased spinal fluid pressures.

Present Research: It is encouraging to note that many researchers have become interested in this problem. Some are re-evaluating the requirement values now being used. The effect of various stresses, heretofore not present in many cattle, is receiving some attention. Since vitamin A *per se* is not present in the feeds normally fed to beef cattle but rather, is present in the form of its precursor, carotene, the question of conversion rate arises and is being studied by some. At the present time, it is generally assumed that 1 mg. of carotene is equivalent to 400 International Units (I. U.) of vitamin A. That this rate of conversion is not constant is now well known, and it appears that under certain conditions it is way below the above value. Hence, attempting to meet the vitamin A needs with carotene alone may result in underestimating the actual vitamin A activity or potency of the ration being fed.

Other workers are interested in the storage losses of carotene, especially in silage, and the use of antioxidants is being evaluated. Basic work on the effect of A deficiency on the status of the mucous membranes, especially the intestinal mucosa, is under way since this is generally believed to be the site of conversion of carotene to vitamin A. The possible interrelationships between the phosphorus content of the ration with vitamin A deficiency and between vitamin A and E in body tissues are being investigated. Thus, it can be seen that the vitamin A problem in beef cattle feeding is being attacked from many angles. As of now, not much new work has reached the publication stage; therefore, recommendations are not forthcoming as yet.

Diagnosis: Prevention of the condition is to be desired. In those cases suspected of being in trouble, a proper diagnosis is most important. Blood carotene or vitamin A values are unfortunately of little value. Liver values are more reliable or are at least repeatable, but normal values have not been established to complete satisfaction. Unfortunately in a given drove of cattle tremendous variations may be found in the degree of severity of avitaminosis A so that a diagnosis based on only a few animals may be misleading. A clearer understanding of the role of vitamin A in the body will help in the diagnosis and treatment of this increasingly widespread feedlot problem.

Important Facts Concerning Tetanus

1. Recovery from tetanus does not usually result in immunity, possibly because of the very small amount of toxin producing the symptoms.
2. Tetanus toxin may be in the bloodstream, following infected wounds for 12 to 24 hours before clinical symptoms are manifested.
3. Immunizing agents are directed against the toxin and not against the organism—the latter can therefore elaborate the toxin after an immunity wears off—therefore destroy the organism by wound treatment.
4. Experimental work indicates that if treatment is begun at the start of the traumatism that penicillin and broad spectrum antibiotics such as tetracycline are highly protective.
5. If at the early treatment both antitoxin and toxoid are used, care must be taken that the two do not neutralize each other by the use of a common syringe, nor should they be injected in bodily areas close to each other—or in other words as far apart as possible.

R. R. Dykstra, D.V.M.

Vitamin A and Dietary Nitrates

"One of the important functions of vitamin A appears to be in the area of steroid and steroid hormone biosynthesis." "It is conceivable that the oxidative destruction of blood and tissue supplies of vitamin A and carotene is among the toxic actions of nitrate." These are excerpts taken from presentations on vitamin A and nitrates at the 1961 Illinois Nutrition Conference. Abstracts of these papers are presented on the following pages to provide information on this important subject.

Role of Vitamin A In Metabolism

B. Connor Johnson

One important function of vitamin A appears to be in the area of steroid hormone biosynthesis. Gluconeogenesis is depressed at a very early stage in vitamin A deficiency, and a histological study of the adrenal cortex shows that the glucocorticoid-producing cells are affected before the depression in gluconeogenesis occurs. On this basis, it appears that vitamin A deficiency leads first to a degeneration of certain adrenal cortex cells and second to the observed depression in gluconeogenesis brought about by the impairment in glucocorticoid production.

There is a block in conversion of cholesterol to corticosterone in the vitamin A-deficient adrenal, and experiments indicate that the block is in the conversion of deoxycorticosterone to corticosterone. There is also evidence that vitamin A functions in the adrenal in the conversion of pregnenolone to progesterone. Recently, it has been found that vitamin A deficiency causes an inhibitory effect on the biosynthesis of cholesterol from mevalonic acid.

Vitamin A has been found to be related to the transfer of sulfate groups into chondroitin sulfate in the bone cells grown in tissue culture. It has been found that the incorporation of sulfate into mucopolysaccharide was reduced by about ½ when there was a deficiency of vitamin A. Recent work has indicated that the vitamin functions in the intestinal mucosa in the formation of the activated sulfate which is required in the sulfonation of mucopolysaccharide.

Vitamin A Deficiencies Under Feedlot Conditions

G. E. Mitchell, Jr.

All farm animals have a physiological requirement for vitamin A. Plants which

make up the bulk of our livestock feeds contain carotenoid materials which animals convert to vitamin A. The most prevalent of the carotenoids is beta carotene, which is essentially a combination of 2 molecules of vitamin A. Green pasture, silage and hay contain large amounts of carotene, while most other common feeds except yellow corn contain relatively little.

Unfortunately, carotene and vitamin A are both easily destroyed by oxidation. Sunbleached hay retains little carotene, and much of the carotene in either hay or corn can be destroyed in a few months of storage, especially in hot weather. On the other hand, storage losses are not great in well-preserved silage.

The Subcommittee on Beef Cattle Nutrition of the National Research Council has reviewed experiments conducted under a variety of conditions and established requirements for both carotene and vitamin A for different weights and classes of beef cattle. The carotene requirements make an allowance for the relative inefficiency of cattle in converting carotene to vitamin A. A full feed of freshly harvested yellow corn will furnish almost enough carotene to meet the NRC requirements.

As storage progresses, it becomes increasingly necessary to furnish additional carotene or vitamin A. A few pounds of good-quality hay or silage will usually make up the difference. If good-quality roughage is not available, a protein supplement that contains alfalfa meal to furnish carotene or is fortified with vitamin A will need to be added. Additional protection against vitamin A deficiency is provided by the ability of the animal to store large amounts of vitamin A and carotene in the liver and other tissues during periods when an excess of carotene or vitamin A is fed. These stores are used during periods of temporary dietary inadequacy. They will protect mature beef cattle from all except the most prolonged and severe deficiencies. The period of protection will usually be from 2 to 4 months when initial stores are good but may be shorter if the ration is quite deficient and other stresses are present.

Application of the guide lines just presented will prevent most, but apparently not all, cases of vitamin A deficiency in the feed lot. Reports of vitamin A deficiency in feed lots where supposedly adequate rations are being fed have increased in recent years. During the past year feed-lot experiments conducted at the Illinois, Indiana, Kentucky, and North Dakota experiment stations have demonstrated the need for additional information concerning the conditions which lead to vitamin A deficiency. If we define vitamin A deficiency as an undesirable condition which can be remedied by administering vitamin A, deficiencies were observed in each of these trials on rations that provided as much or more carotene and/or vitamin A than the NRC requirements.

Effects of High Nitrate Feeds on Vitamin A

G. S. Smith

A problem of considerable economic importance is the poor performance of cattle and sheep when fed forages or silages produced from soils heavily fertilized with nitrogen fertilizers. The problem has been particularly prevalent in conjunction with silage-feeding programs, and it has arisen in some instances during full feeding of cattle on high corn rations following a winter program of silage feeding. The problem also appears to be related to factors that presumably would favor the accumulation of nitrates and nitrites in plant forages. Drought, heat, excessive crowding and shading of plants, and even water-logged soils are believed to contribute to it. These findings suggest that dietary nitrates or nitrites are involved, possibly as primary etiological factors.

Dietary nitrate is either absorbed or converted to nitrite and other compounds in the alimentary tract of the animal. Absorbed nitrates may also be reduced to nitrite in the blood and tissues. The extent to which reduction of nitrate occurs in the

alimentary tract depends on many factors. Conversion is usually rather complete because of active fermentation in the rumeno-reticulum. The nitrite ion, whether absorbed from the alimentary tract or produced by reduction of nitrate in the tissues, exerts a highly toxic effect by forming methemoglobin and consequently impairing the ability of the blood to transport oxygen. The nitrate ion as such has a rather low order of toxicity to animal tissues.

The toxicity of nitrite is not restricted to the oxidation of ferro-hemoglobin to ferri-hemoglobin (methemoglobin formation) but is involved in many other oxidative processes. In view of the susceptibility of both vitamin A and carotene to oxidative destruction, it is conceivable that the oxidative destruction of blood and tissue supplies of vitamin A and carotene is among the toxic actions of nitrite. Such an effect may well be marked in acute cases of nitrite toxicity but also become manifest in more chronic cases. A more far-reaching effect of nitrite may be the alteration of protein enzymes required to convert carotene to vitamin A or the impairment of processes involved in the functional metabolism of vitamin A.

In many cases of poor feedlot performance, the animals have shown symptoms of vitamin A deficiency even though the rations provided carotene in amounts considered adequate by present standards.[1,2] Such animals have responded more satisfactorily to supplementation with preformed vitamin A than carotene, indicating an impaired ability to utilize carotene. Recent work has shown improved performance by feedlot cattle on rations supplemented with vitamin A even though they were also high in carotene.[2] From this it is reasonable to speculate that the difficulty involves destruction of carotene in the gastrointestinal tract of the animal, failure to absorb carotene, or impaired ability to utilize carotene. Whether it relates directly to dietary nitrate or nitrite and what, if any, other factors are involved is not known.

Recent studies with the non-ruminant show that dietary nitrite hastens the depletion of liver vitamin A stores.[4] Inconclusive and/or contradictory results obtained in similar studies[5,6] with non-ruminants fed nitrate rather than nitrite are presumably explained by differences in the extent to which nitrate was converted to nitrite or by differences in the liver stores of vitamin A when the test was started. Studies with ruminants[7,8] suggest wide differences among animals in tolerance to dietary nitrate. Such differences are obviously related to many factors, including diet and reductive activity in the rumen. They may also relate to the over-all condition of the animal, including the status of vitamin A nutrition.

Studies of the role of vitamin A and vitamin E in the nutrition of animals have established that vitamin E, as an antioxidant, protects vitamin A from oxidative destruction both in feeds and in the tissues of animals. Since the vitamin A deficient animal has an impaired ability to convert carotene to vitamin A,[9] it is therefore not surprising that vitamin E increases the conversion of carotene to vitamin A in animals with low stores of vitamin A.

It has been shown that carotene conversion in the laboratory animal is increased when thyroid activity is stimulated and decreased when thyroid activity is suppressed.[10] Recent studies[11] explain much of the controversy on this point by relating the carotene conversion activity to 3, 5, 3'-triiodothyronine rather than to thyroxin *per se*. Thyroid activity is presumably depressed in hot weather.

Whether the functional requirement for vitamin A *per se* is increased or decreased in hot weather or under conditions of hyper- or hypothyroidism is not known. Likewise it is not known whether nitrates or nitrites exert a primary effect on thyroid activity or to what extent the vitamin A status of animals receiving nitrates or nitrites is affected by changes in thyroid activity. It is conceivable that high-nitrate forages or silages exert their detrimental influence on the animal through some principle other than nitrite or nitrate.

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Nitrate Poisoning In Ruminants

J. H. Solkolowski

Oat hay poisoning and cornstalk poisoning are terms that have been commonly used in conjunction with nitrate poisoning in ruminants. Oat hay and cornstalks have, however, not been the exclusive cause of nitrate toxicity in livestock. Wheat, barley, weeds and some grasses have been found to accumulate nitrates in their tissues. This accumulation of nitrate has been found to be caused by drought conditions, soils low in trace minerals (particularly molybdenum), shading of the growing plants, heavy planting rates (possibly correlated to shading) and heavy fertilization rates. Other causative agents have included nitrate fertilizers, commercial dynamite and well water containing nitrate.

A series of trials were initiated at Illinois to study the effects of nitrate (potassium nitrate) ingestion by growing-fattening lambs. In one trial native crossbred lambs weighing approximately 80 lb. were fed various levels of potassium nitrate (up to 12.8% of the total ration) in suitably balanced rations. No ill effects due to the nitrate were observed in any of the treated lambs.

In another trial lambs receiving 0%, 4.8% and 6.4% potassium nitrate, as a percent of the total ration, were fed their respective rations for a period of 129 days with no observed ill effects. It was found when potassium nitrate was incorporated in a complete ration, growing-fattening lambs were able to make normal weight gains on a relatively low level of feed intake (1,000 gm. per lamb per day). These results would indicate that the nitrogen in the potassium nitrate was probably utilized in a manner similar to that of other forms of nonprotein nitrogen.

The relationship between vitamin A and nitrate poisoning has been inferred for many years. Recommendations for the prevention and/or treatment of nitrate-induced poisoning have included the administration of vitamin A to animals so affected. This probably stems from the development of "subclinical" vitamin A deficiency symptoms in animals receiving silage or hay or pasture as their primary source of nutriment. The supplementation of vitamin A in some form has in many instances alleviated the growth depression and other symptoms noted. However, satisfactory and conclusive data resulting from controlled experimentation are lacking on this subject.

An initial study compared vitamin A and carotene at the recommended NRC levels with and without potassium nitrate. The treatments used included 6.4% potassium nitrate with carotene, vitamin A and neither. The nitrate was added as a percent of the total ration. The animals were on the experiment for 83 days. During this time no gross symptoms of nitrate toxicity or vitamin A deficiency were observed. Blood analysis for vitamin A and

carotene gave no definite conclusion as to the effect of the treatments. However, a definite depression in average daily gain also occurred within the nitrate-treated group, indicating a possible relationship between nitrate, vitamin A and carotene.

In an additional study involving vitamin A, the average daily gain of lambs receiving 4.8% potassium nitrate plus 22,000 I.U. of vitamin A per pound of feed was 68% higher than that of the control group receiving nitrate plus 1,000 I.U. of vitamin A. Similar results were obtained with lambs receiving 9.6% of potassium nitrate.

Chronic Nitrate Toxicity

William H. Pfander

Much interest in nitrate toxicity followed the 1954 drought. Many animals died from acute toxicity after being exposed about 4 days. Field observations suggested that a chronic toxicity also occurred that was not associated with methemoglobin formation and that sometimes might be seen with very low levels of nitrate intake.

Four sets of observations were made on cattle which may relate to the problem:

1. When drought corn silage was fed to open cows on pasture, their appetites were reduced within a week.

2. Bred beef cows fed drought corn silage containing 1.4% KNO_3 became irritable, urinated excessively, and 4 cows aborted. A second group fed the same ration supplemented with 2 lb. of molasses daily wintered well and calved normally.

3. Cows in the Mehmert herd at Chamois, Mo., fed on corn silage and alfalfa hay containing 2 and 0.1 — 0.7% KNO_3, respectively, reduced their milk production. No live protozoa were observed in the rumens of several of these cows. Milk production returned to normal when nitrate intake was reduced and molasses was added to the ration.

4. Two dairy cows in mid-lactation were fed 1.25% and 0.75% KNO_3, respectively. Both cows decreased milk production; the cow on the highest level died, and the other cow aborted. Few investigators have been able to confirm this observation, but a review of the experimental procedures showed that the major difference between this trial and others was that the nitrate was mixed in the feed twice daily.

Silages of corn grown on soil high in nitrogen and made with various preservatives were evaluated by feeding them to mature wethers. At the time they were fed, most of the nitrate had disappeared. The sheep fed the nitrate-containing silages retained more nitrogen than did sheep receiving an unsupplemented control silage. In the presence of supplemental soybean meal and minerals, the utilization of nitrate was low. Significant decreases in digestibility of cellulose and organic matter occurred when nitrate was added to the silage at time of feeding. Blood nitrate concentrations were low on all treatments. Sheep that received silage made without preservatives generally had lower blood vitamin A than those that received silages preserved with corn, BHA or combinations. One percent of urea in the silage resulted in a reduction of vitamin A in the sheep's blood. The lowest observed blood concentrations occurred when 15 gm. KNO_3 were added to low-nitrate corn silage. When nitrate was present, the addition of 4,000 I.U. of beta carotene to the daily ration was not sufficient to return the vitamin A level to that previously observed.

Investigators in the Department of Agricultural Chemistry recently produced an apparent vitamin E deficiency in rats by feeding potassium nitrite. We have fed a group of lambs a ration low in vitamins A and E for the past 6 months, along with as much as 0.75% KNO_2, and produced only one stiff lamb. Mature sheep apparently are not suitable assay animals for reproducing "chronic nitrate toxicity" as it is often seen under Missouri field conditions.

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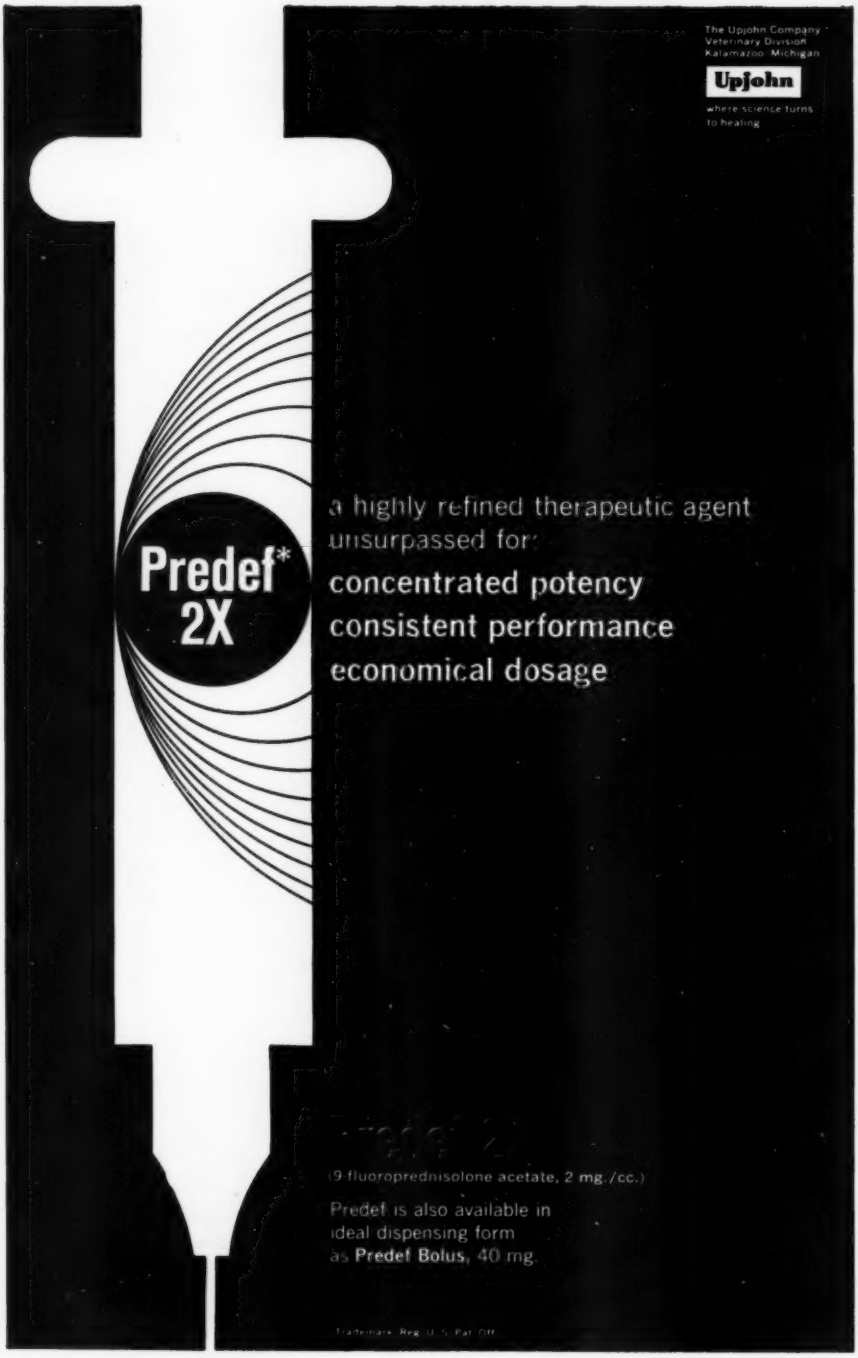
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